EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Part 15 Subpart C and E
&
Industry Canada (IC) RSS-210, RSS-GEN

A division of Research In Motion Limited

REPORT NO.: RTS-6012-1208-46

PRODUCT MODEL NO.: RFF91LW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARFF90LW
IC: 2503A-RFF90LW

DATE: November 09, 2012

RTS is accredited
according to
EN ISO/IEC 17025 by:

592

Statement of Performance:

The BlackBerry® smartphone, model RFF91LW, part number CER-48927-001 Rev2, and its accessories perform within the requirements of the test standards when configured and operated under RIM's operation instructions.

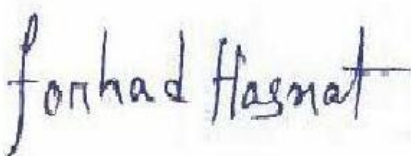
Declaration:

We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test results are valid for the tested unit (s) only.
The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.
The test methods were consistent with the methods described in the relevant standards.

Documented by:

Savtej S. Sandhu
Regulatory Compliance Specialist
Date: November 09, 2012

Reviewed by:



Forhad Hasnat
Regulatory Compliance Specialist
Date: November 12, 2012

Reviewed and Approved by:

Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance
Date: November 13, 2012

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A. Scope

This report details the results of compliance tests which were performed in accordance to the requirements of:

- o FCC CFR 47 Part 15, Subpart C, October, 2011
- o FCC CFR 47 Part 15, Subpart E, October, 2011
- o Industry Canada, RSS-210, Issue 8, December 2010, Licence-exempt Radio Apparatus
- o Industry Canada, RSS-GEN, Issue 3, December 2010, General Requirements and Information for the Certification of Radio Apparatus

B. Associated Documents

1) MultiSourceDeclaration_RFF91LW_b1354
2) MultiSourceDeclaration_RFF91LW_b1651
3) MultiSourceDeclaration_RFF91LW_10.0.9.299
4) MultiSourceDeclaration_RFF91LW_10.0.9.728
5) RFF91LW_HW_Declaration_CER-48927-001_Rev2

C. Product Identification

Manufactured by Research In Motion Limited whose headquarters is located at:
295 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

The equipment under test (EUT) was tested at the following locations:

RIM Testing Services EMI test facilities

305 Phillip Street	440 Phillip Street
Waterloo, Ontario	Waterloo, Ontario
Canada, N2L 3W8	Canada, N2L 5R9
Phone: 519 888 7465	Phone: 519 888 7465
Fax: 519 888 6906	Fax: 519 888 6906

The testing was performed from June 21 to July 25, September 17-19, and October 11 and 29-30, 2012.

The sample EUT included:

SAMPLE	MODEL	CER NUMBER	PIN	SOFTWARE
1a	RFF91LW	CER-48927-001 Rev1	2A211CB7	OS Version: 127.0.1.1192 Bundle 1192
1b	RFF91LW	CER-48927-001 Rev1	2A211CB7	OS Version: 127.0.1.1267 Bundle 1267
1c	RFF91LW	CER-48927-001 Rev1	2A211CB7	OS Version: 127.0.1.1651 Bundle 1651
2a	RFF91LW	CER-48927-001 Rev1	2A202A6D	OS Version: 127.0.1.1192 Bundle 1192
2b	RFF91LW	CER-48927-001 Rev1	2A202A6D	OS Version: 127.0.1.1267 Bundle 1267
2c	RFF91LW	CER-48927-001 Rev1	2A202A6D	OS Version: 127.0.1.1651 Bundle 1651
3a	RFF91LW	CER-48927-001 Rev1	2A202982	OS Version: 127.0.1.1192 Bundle 1192
3b	RFF91LW	CER-48927-001 Rev1	2A202982	OS Version: 127.0.1.1267 Bundle 1267
3c	RFF91LW	CER-48927-001 Rev1	2A202982	OS Version: 127.0.1.1312 Bundle 1312
4	RFF91LW	CER-48927-001 Rev2	2A8C6FE2	OS Version: 127.0.1.1651 Bundle 1651
5	RFF91LW	CER-48927-001 Rev2	2A8C6FD6	OS Version: 10.0.9.299 Bundle 299
6	RFF91LW	CER-48927-001 Rev2	2A8C7031	OS Version: 10.0.9.728 Bundle 728

AC Line Conducted Emissions testing was performed on sample 1b, 2b and 5.
Radiated Emissions testing was performed on samples 1a, 1b, 1c, 2a, 2b, 2c, 4 and 5.
Conducted Emissions testing was performed on sample 3a, 3b, 3c and 6.
Near Field Communications testing was performed on sample 1b and 3c.

Only the characteristics that may have been affected by the changes from RFF91LW Rev1 to RFF91LW Rev2 were re-tested.
For more details, refer to RFF91LW_HW_Declaration_CER-48927-001_Rev2.

To view the differences between software bundles 127.0.1.1192 to 10.0.9.728 for RFF91LW, see document MultiSourceDeclaration_RFF91LW_b1354, MultiSourceDeclaration_RFF91LW_b1651, MultiSourceDeclaration_RFF91LW_10.0.9.299 and MultiSourceDeclaration_RFF91LW_10.0.9.728.

BlackBerry® smartphone Accessories Tested

1) Fixed Blade Charger, part number HDW-47725-001, with an output voltage of 5.0 volts dc, 850 mA
2) Folding Blade Charger, part number HDW-34724-001, with an output voltage of 5.0 volts dc, 1.8 A.
3) World Wide Travel Charger, part number HDW 34725-001, with an output voltage of 5.0 volts, dc, 2A.
4) Alt. Fixed Blade Charger, part number HDW-47725-001, with an output voltage of 5.0 volts, dc, 850mA.
5) Wired Headset, part number HDW-44306-001, with a lead length of 1.1 metres.
6) Alt. Wired Headset, part number HDW-44306-001, with a lead length of 1.1 metres.
7) Alt.2 Wired Headset, part number HDW-44306-003, with a lead length of 1.1 metres.
8) USB Data Cable, part number HDW-28109-003, 1.20 metres long.
9) USB Data Cable, part number HDW-48415-001, 1.0 metre long.
10) HDMI Cable, part number HDW-29572-001, 1.8 metres long.

D. Support Equipment Used for the Testing of the EUT

1) Philips Monitor, type MWE12244T, product ID 2444E1SB/27

E. Test Results Chart

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.207	RSS-210 RSS-GEN	Conducted AC Line Emission	Pass	1
Part 15.209 Part 15.247	RSS-210 RSS-GEN	BT/BLE Radiated Spurious Emissions	Pass	2
Part 15.209 Part 15.247	RSS-210 RSS-GEN	BT/BLE Radiated Band Edge Compliance	Pass	2
Part 15.209 Part 15.247	RSS-210 RSS-GEN	802.11b/g/n Radiated Spurious Emissions	Pass	2
Part 15.209 Part 15.247	RSS-210 RSS-GEN	802.11b/g/n Radiated Band Edge Compliance	Pass	2
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11a/n Radiated Spurious Emissions	Pass	3
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11a/n Radiated Band Edge Compliance	Pass	3
Part 15.247(a)	RSS-210	BT, 20 dB Bandwidth	Pass	4
Part 15.247(a)	RSS-210	BT, Carrier Frequency Separation	Pass	4
Part 15.247(a)	RSS-210	BT, Number of Hopping Frequencies	Pass	4
Part 15.247(a)	RSS-210	BT, Time of Occupancy (Dwell Time)	Pass	4
Part 15.247(b)	RSS-210	BT, Maximum Peak Conducted Output Power	Pass	4
Part 15.247(c)	RSS-210	BT, Band-Edge Compliance of RF Conducted Emissions	Pass	4
Part 15.247(c)	RSS-210	BT, Spurious RF Conducted Emissions	Pass	4
Part 15.247(a)	RSS-210	BLE, 6 dB Bandwidth	Pass	4
Part 15.247(b)	RSS-210	BLE, Maximum Conducted Output Power	Pass	4
Part 15.247(c)	RSS-210	BLE, Band-Edge	Pass	4
Part 15.247(d)	RSS-210	BLE, Peak Power Spectral Density	Pass	4
Part 15.247(c)	RSS-210	BLE, Spurious RF Conducted Emissions	Pass	4

Test Results Chart cont'd

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.247(a)	RSS-210	802.11b/g/n, 6 dB Bandwidth	Pass	5
Part 15.247(b)	RSS-210	802.11b/g/n, Maximum Conducted Output Power	Pass	5
Part 15.247(c)	RSS-210	802.11b/g/n, Band-Edge	Pass	5
Part 15.247(d)	RSS-210	802.11b/g/n, Peak Power Spectral Density	Pass	5
Part 15.247(c)	RSS-210	802.11b/g/n, Spurious RF Conducted Emissions	Pass	5
Part 15.407	RSS-210	802.11a/n, 6 dB Bandwidth	Pass	6
Part 15.407	RSS-210	802.11a/n, Maximum Conducted Output Power	Pass	6
Part 15.407	RSS-210	802.11a/n, Band-Edge	Pass	6
Part 15.407	RSS-210	802.11a/n, Peak Power Spectral Density	Pass	6
Part 15.407	RSS-210	802.11a/n, Spurious RF Conducted Emissions	Pass	6
Part 15.209 Part 15.225(a)	RSS-210 RSS-GEN	Near Field Communications, Radiated Emissions	Pass	7
Part 15.225(e)	RSS-210	Near Field Communications, Occupied Bandwidth	Pass	7
Part 15.225(e)	RSS-210	Near Field Communications, Frequency Stability	Pass	7

F. Summary of Results

1) AC LINE CONDUCTED EMISSIONS

The conducted emissions were measured using the test procedure outlined in CISPR Recommendation 22 through a 50 Ohm Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to an EMI receiver system with characteristics that duplicate those of the receiver specified in CISPR Publication 16. BlackBerry® smartphone was in battery charging mode. The input voltage was 120 V, 60 Hz.

The following test configurations were measured:

Test Configuration	Operating Mode(s)	Charger + Accessories
1	Bluetooth Tx + Audio Playing	Fixed Blade Charger + Wired Headset + USB Cable 1.20m
2	802.11b Tx + Video Playing	Folding Blade Charger + Alt. Wired Headset
3	NFC Tx	World Wide Travel Charger + Wired Headset
4	Bluetooth Tx	Alt. Fixed Blade Charger + Alt.2 Wired Headset + USB Cable 1.00m + HDMI Cable + HD Monitor

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart C and IC RSS-210 limits. The sample EUT had a worst case test margin of 7.18 dB below the QP limit at 0.483 MHz and 2.80 dB below the AV limit at 1.221 MHz with the Folding Blade Charger in Test Configuration 2 and the Alt. Fixed Blade Charger in Test Configuration 4 respectively.

See APPENDIX 1 for the test data.

Measurement Uncertainty ±3.2 dB

2) BLUETOOTH, BLUETOOTH LOW ENERGY AND 802.11b/g/n RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

The EUT was placed on a nonconductive styrofoam table, 80 cm high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 25.0 GHz. Both the horizontal and vertical polarizations of the emissions were measured.

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a semi-anechoic chamber (SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The SAC with floor absorber's FCC registration number is **959115** and the IC file number is **2503C-1**.

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications.

The BlackBerry® smartphone was measured in standalone configuration with Bluetooth transmitting in single frequency mode at low channel (0), middle channel (39) and high channel (78) for packet type "DH5", "2-DH5" and "3-DH5". The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart C, 15.247 and RSS-210.

The BlackBerry® smartphone was measured in standalone configuration with Bluetooth Low Energy transmitting in single frequency mode at low channel (0), middle channel (20) and high channel (39). The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart C, 15.247 and RSS-210.

The BlackBerry® smartphone was measured in standalone configuration transmitting on channels 1, 6 & 11 at 1 Mbps for 802.11b mode, at 6 Mbps for 802.11g mode, and at MCS 0 for 802.11n mode. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart C, 15.247 and RSS-210.

The Bluetooth harmonics were investigated up to the 10th harmonic. The worst case test margin was 6.19 dB below the accepted limit at 517.725 MHz.

The Bluetooth Low Energy harmonics were investigated up to the 10th harmonic. The worst case test margin was 10.26 dB below the accepted limit at 517.730 MHz.

The 802.11b/g/n harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).
See APPENDIX 2 for the test data.

b) Band-Edge Compliance of RF Radiated Emissions
The BlackBerry® smartphone met the requirements for band-edge compliance of RF radiated emissions for Bluetooth, Bluetooth Low Energy and 802.11b/g/n as per the requirements of 15.247, 15.209, and RSS-210/RSS-GEN.

Measurement Uncertainty ±4.5 dB
See APPENDIX 2 for the test data

3) 802.11a/n RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

The EUT was placed on a nonconductive styrofoam table, 80 cm high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 40.0 GHz. Both the horizontal and vertical polarizations of the emissions were measured.

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a semi-anechoic chamber (SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The SAC with floor absorber's FCC registration number is **959115** and the IC file number is **2503C-1**.

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications.

The BlackBerry® smartphone was measured in standalone configuration transmitting on channels 36, 48, 64, 100, 140 and 165 at 6 Mbps for 802.11a mode and at MCS 0 for 802.11n. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart E, 15.407 and RSS-210/RSS-GEN.

The 802.11a/n harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).

See APPENDIX 3 for the test data.

b) Band-Edge Compliance of RF Radiated Emissions

The BlackBerry® smartphone met the requirements for band-edge compliance of RF radiated emissions for 802.11a/n as per the requirements of 15.407, 15.209 and RSS-210/ RSS-GEN.

See APPENDIX 3 for the test data

Measurement Uncertainty ±4.5 dB

4) i) BLUETOOTH RF CONDUCTED EMISSIONS

The Bluetooth conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) 20 dB Bandwidth
The BlackBerry® smartphone met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case 20 dB Bandwidth was 0.923 MHz for channels 39 and 78 in normal data rate mode and 1.319 MHz for channel 78 in EDR mode.
See APPENDIX 4 for the test data.

b) Carrier Frequency Separation
The BlackBerry® smartphone met the requirements of the carrier frequency separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. The result includes both normal data rate and EDR.
See APPENDIX 4 for the test data.

c) Number of Hopping Frequencies
The BlackBerry® smartphone met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. The number of hopping channels measured was 79.
See APPENDIX 4 for the test data.

d) Time of Occupancy (Dwell Time)
The EUT met the requirements of the dwell time as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in DH1, DH3 and DH5 modes. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.
See APPENDIX 4 for the test data.

e) Maximum Peak Conducted Output Power
The BlackBerry® smartphone met the requirements of the maximum peak conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case Conducted Output Power level was 8.11 dBm (0.00647 W) for Channel 0 in normal data rate mode and 7.52 dBm (0.00565 W) for channel 0 in EDR mode.
See APPENDIX 4 for the test data.

f) Band-Edge Compliance of RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the band-edge compliance of RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode. The result includes both normal data rate and EDR.
See APPENDIX 4 for the test data.

g) Spurious RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 10 MHz to 26 GHz. Low channel (0), middle channel (39) and high channel (78) were measured in single frequency mode and frequency hopping (Euro/US) mode. The result includes both normal data rate and EDR.
See APPENDIX 4 for the test data.

4) ii) BLUETOOTH LOW ENERGY RF CONDUCTED EMISSIONS

The Bluetooth Low Energy conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case 6 dB Bandwidth was 0.673 MHz for channel 0.
See APPENDIX 4 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case Conducted Output Power level was 7.75 dBm (0.00596 W) for channel 0.
See APPENDIX 4 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.247(b) and RSS-210. Low channel (0) and high channel (39) were measured.
See APPENDIX 4 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 4 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 4 for the test data.

5) 802.11b/g/n RF CONDUCTED EMISSIONS

The 802.11b/g/n conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case 6 dB Bandwidth was 10.33 MHz for channel 11 in 802.11b mode, 16.43 MHz for channels 11 in 802.11g mode, and 17.42 MHz for channel 11 in 802.11n mode.
See APPENDIX 5 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case Conducted Output Power level was 18.82 dBm (76.21 mW) for channel 1 in 802.11b mode, 16.82 dBm (48.08 mW) for channel 6 in 802.11g mode, and 16.33 dBm (42.95 mW) for channel 6 in 802.11n mode.
See APPENDIX 5 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.247(b) and RSS-210. Low channel (1) and high channel (11) were measured.
See APPENDIX 5 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 5 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 5 for the test data.

6) 802.11a/n RF CONDUCTED EMISSIONS

The 802.11a/n conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart E.

a) 6 dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured. The worst case 6 dB Bandwidth was 16.44 MHz for channel 165 in 802.11a mode. The worst case 6 dB Bandwidth was 17.60 MHz for channels 36 and 64 in 802.11n mode.
See APPENDIX 6 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured. The worst case Conducted Output Power level was 14.77 dBm (29.99 mW) for channel 100 in 802.11a mode. The worst case Conducted Output Power level was 14.17 dBm (26.12 mW) for channel 64 in 802.11n mode.
See APPENDIX 6 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 52, 64, 100, 149, 161 and 165 were measured.
See APPENDIX 6 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 were measured.
See APPENDIX 6 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. The frequency range measured was 30 MHz to 40 GHz. Channels 44, 60 and 157 were measured.
See APPENDIX 6 for the test data.

7) Near Field Communications (NFC)

The Near Field Communications emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) Radiated Emissions
The BlackBerry® smartphone was measured in standalone configuration transmitting at 13.56 MHz. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart C, 15.209, 15.225(a) and RSS-210/RSS-GEN.

The NFC emissions were investigated from 9 kHz to 1 GHz. The sample EUT has a field strength measurement of 50.46 dBuV/m.
See APPENDIX 7 for the test data.

b) Occupied Bandwidth
The EUT met the requirements of the Occupied bandwidth as per 47 CFR 15 C and RSS-210. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 7 for the test data.

c) Frequency Stability
The EUT met the requirements of the Frequency Stability as per 47 CFR 15.225(e) and RSS-210. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 7 for the test data.

G. Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
EMI Test Receiver	Rohde & Schwarz	ESIB 40	100255	12-12-08	Conducted/Radiated Emissions
EMI Test Receiver	Rohde & Schwarz	ESU 40	100162	12-12-07	Conducted/Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	13-08-23	Radiated Emissions
Horn Antenna	CMT	3116	R52734-001	14-08-02	Radiated Emissions
Horn Antenna	ETS-Lindgren	3117	2538	13-08-04	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	13-09-01	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	13-10-10	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	13-09-01	Radiated Emissions
L.I.S.N.	Rohde & Schwarz	ENV216	100060	13-10-25	Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	13-10-30	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	13-01-03	Radiated Emissions
Spectrum Analyzer	HP	8563E	3745A08113	13-10-05	RF Conducted Emissions
DC Power Supply	HP	6632B	US37472178	13-09-25	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0340060	13-10-30	RF Conducted Emissions
Environmental Chamber	Test Equity	107	0900246	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	119549	12-12-01	RF Conducted Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100368	12-11-30	Radiated Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100370	12-11-30	Radiated Emissions
Power Meter	Agilent	N1911A	MY45100951	13-08-16	RF Conducted / Frequency Stability
Power Sensor	Agilent	N1921A	MY45241383	13-09-11	RF Conducted / Frequency Stability
Digital Multimeter	Hewlett Packard	34401A	US36042324	12-11-16	Conducted/Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0380567	13-10-30	Radiated Emissions

APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS

AC Conducted Emission Test Results

The following tests were performed by Shuo Wang.

Test Configuration 1

The BlackBerry® smartphone was tested on July 03, 2012.

The environmental test conditions were: Temperature: 26 ºC
Relative Humidity: 37 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.150	L1	41.94	11.20	53.14	66.00	56.00	-12.86
0.168	L1	29.49	11.08	40.57	65.10	55.10	-24.53
0.596	L1	22.56	9.86	32.42	56.00	46.00	-23.58
11.355	N	25.92	10.00	35.93	60.00	50.00	-24.08
12.021	L1	33.31	10.02	43.33	60.00	50.00	-16.67

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak detector.
See figure 1-1 and figure 1-2 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

AC Conducted Emissions Test Graphs

Test Configuration 1

Figure 1-1: L1 lines

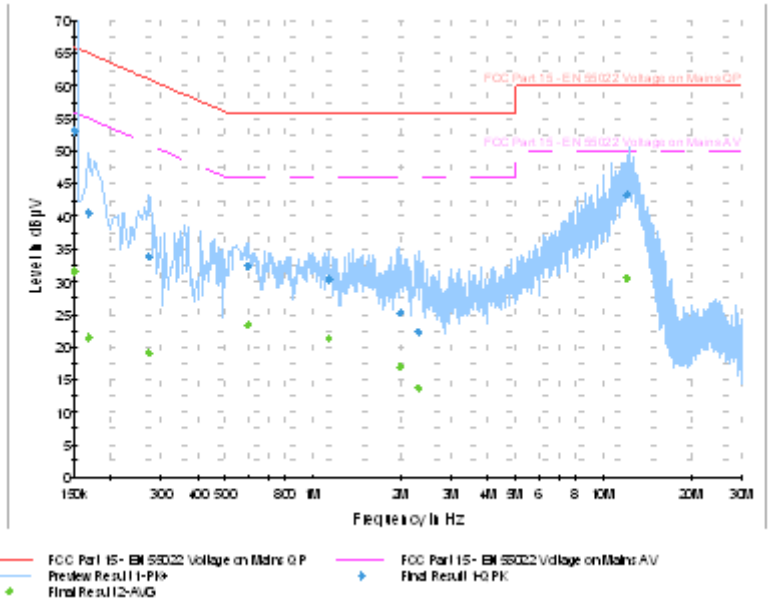
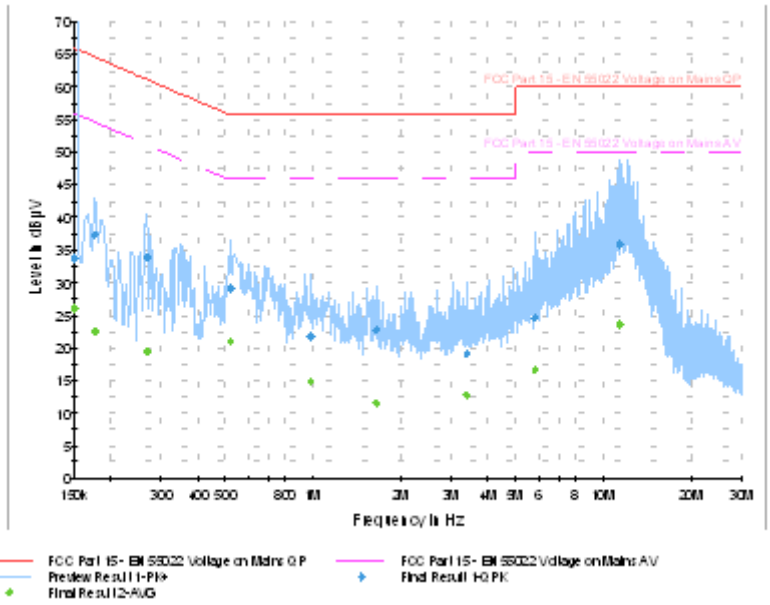


Figure 1-2: N Lines



AC Conducted Emission Test Results cont'd

Test Configuration 2

The BlackBerry® smartphone was tested on July 03, 2012.

The environmental test conditions were: Temperature: 26 ºC
Relative Humidity: 37 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Margin (QP) Limits (dB)
0.150	L1	40.42	11.20	51.62	66.00	-14.38
0.150	N	33.20	11.23	44.43	66.00	-21.57
0.204	L1	38.24	10.83	49.07	63.40	-14.33
0.204	N	31.20	10.85	42.06	63.40	-21.35
0.249	L1	31.01	10.51	41.53	61.80	-20.27
0.254	N	31.24	10.50	41.74	61.60	-19.86
0.303	N	30.84	10.17	41.01	60.20	-19.19
0.308	L1	27.78	10.15	37.93	60.00	-22.07
0.402	N	23.13	10.02	33.15	57.80	-24.65
0.407	L1	33.41	10.00	43.41	57.70	-14.29
0.456	L1	38.64	9.93	48.58	56.80	-8.22
0.483	N	39.20	9.93	49.12	56.30	**-7.18**
0.929	L1	30.85	9.81	40.66	56.00	-15.34
1.158	N	27.15	9.80	36.95	56.00	-19.05
1.221	L1	26.45	9.80	36.25	56.00	-19.75
1.752	N	22.81	9.82	32.63	56.00	-23.37
1.919	L1	26.61	9.82	36.43	56.00	-19.57
3.647	L1	21.27	9.89	31.16	56.00	-24.84

AC Conducted Emissions Test Results cont'd

Test Configuration 2 cont'd

Frequency (MHz)	Line	Reading (AV) (dBµV)	Correction Factor (dB)	Corrected Reading (AV) (dB)	Limit (AV) (dBµV)	Margin (AV) Limits (dB)
0.150	L1	30.24	11.20	41.45	56.00	-14.55
0.150	N	26.88	11.23	38.11	56.00	-17.89
0.204	L1	28.69	10.83	39.52	53.40	-13.88
0.204	N	27.79	10.85	38.64	53.40	-14.76
0.249	L1	24.10	10.51	34.61	51.80	-17.19
0.254	N	28.65	10.50	39.15	51.60	-12.45
0.303	N	19.73	10.17	29.90	50.20	-20.30
0.308	L1	23.01	10.15	33.16	50.00	-16.84
0.402	N	18.61	10.02	28.63	47.80	-19.17
0.407	L1	28.59	10.00	38.59	47.70	-9.11
0.456	L1	32.93	9.93	42.86	46.80	-3.94
0.483	N	32.87	9.93	42.80	46.30	-3.50
0.929	L1	24.74	9.81	34.54	46.00	-11.46
1.158	N	22.08	9.80	31.88	46.00	-14.12
1.221	L1	19.91	9.80	29.71	46.00	-16.29
1.752	N	17.21	9.82	27.03	46.00	-18.97
1.919	L1	20.20	9.82	30.02	46.00	-15.98
3.647	L1	15.06	9.89	24.96	46.00	-21.04
6.054	N	17.19	9.93	27.12	50.00	-22.88

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak and the average detectors.
See figure 1-3 and figure 1-4 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

AC Conducted Emissions Test Graphs

Test Configuration 2

Figure 1-3: L1 lines

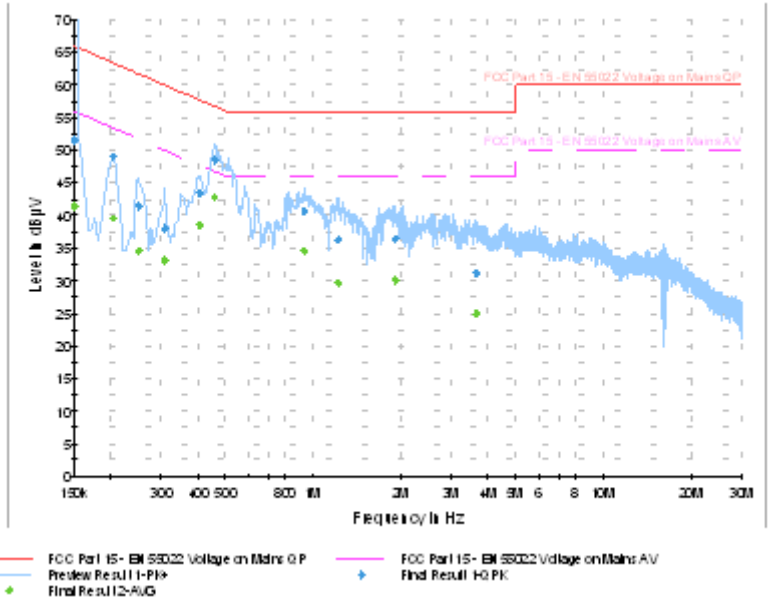
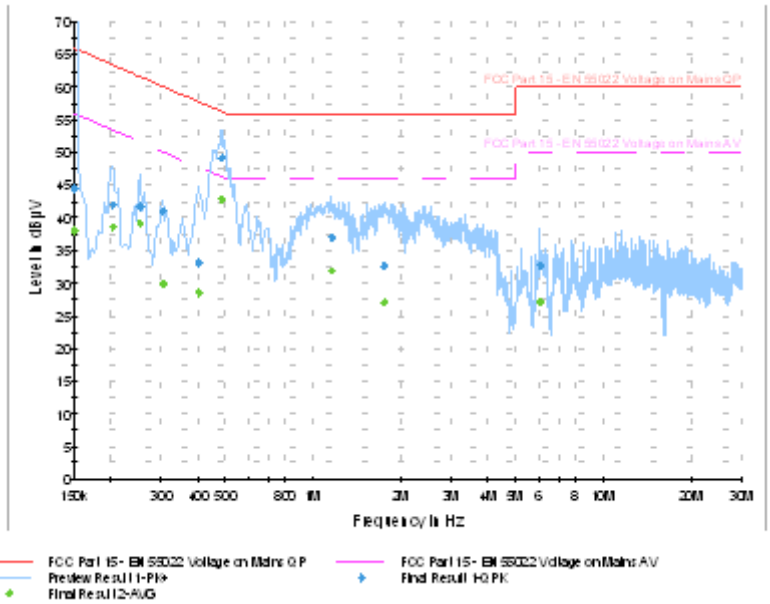


Figure 1-4: N Lines



AC Conducted Emissions Test Results cont'd

Test Configuration 3

The BlackBerry® smartphone was tested on September 17, 2012.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 33 %

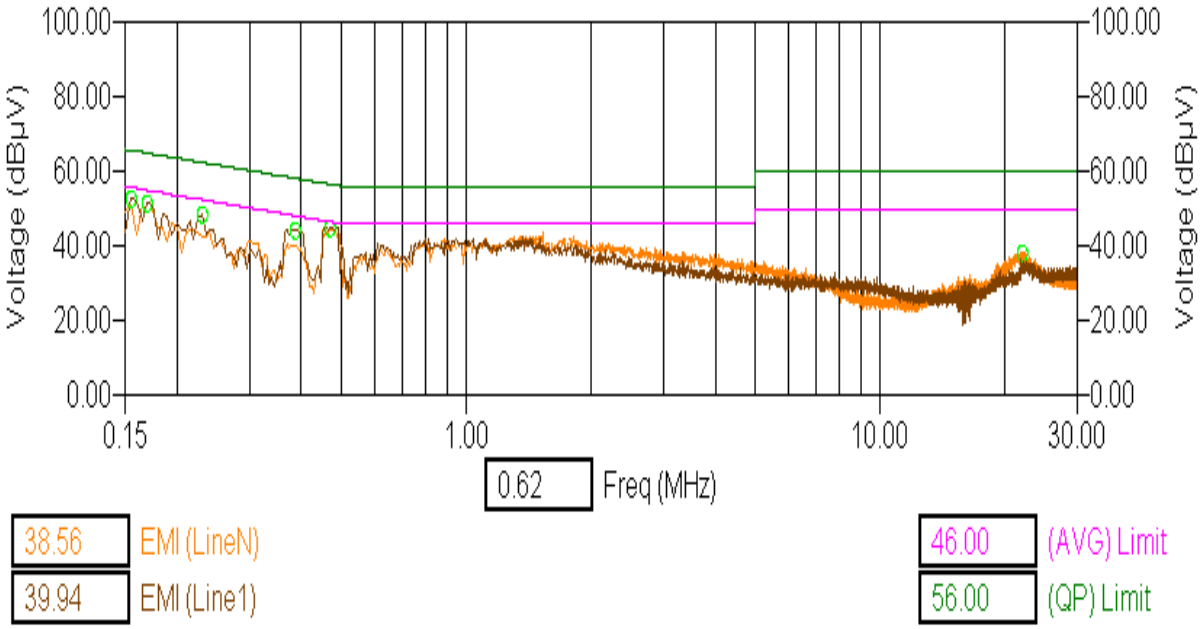
Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.161	L1	37.57	9.86	47.43	65.73	55.73	-18.30
0.164	L1	37.78	9.88	47.66	64.96	54.96	-17.30
0.236	L1	32.22	9.89	42.11	62.45	52.45	-20.34
0.388	L1	33.50	9.91	43.41	58.17	48.17	-14.76
0.478	L1	34.06	9.92	43.98	56.51	46.51	-12.53

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak detector.
See figure 1-5 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

AC Conducted Emissions Test Graphs

Test Configuration 3

Figure 1-5: L1, N lines



AC Conducted Emission Test Results cont'd

Test Configuration 4

The BlackBerry® smartphone was tested on October 11, 2012.

The environmental test conditions were: Temperature: 26 ºC
Relative Humidity: 29 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Margin (QP) Limits (dB)
0.195	L1	34.02	10.89	44.91	63.80	-18.89
0.200	N	34.70	10.89	45.58	63.60	-18.02
0.303	L1	32.66	10.16	42.82	60.20	-17.38
0.380	N	38.14	10.05	48.19	58.30	-10.11
0.429	L1	39.11	9.97	49.08	57.30	-8.22
0.429	N	36.86	9.98	46.84	57.30	-10.46
0.803	L1	37.70	9.82	47.52	56.00	-8.48
0.830	N	35.02	9.82	44.84	56.00	-11.16
0.983	N	34.33	9.81	44.14	56.00	-11.86
1.221	L1	36.28	9.80	46.09	56.00	-9.91
1.379	N	34.37	9.81	44.18	56.00	-11.82
4.043	N	30.76	9.90	40.67	56.00	-15.34
4.074	L1	30.17	9.90	40.07	56.00	-15.93
5.474	N	28.62	9.91	38.54	60.00	-21.46
5.609	L1	30.33	9.91	40.24	60.00	-19.76

AC Conducted Emissions Test Results cont'd

Test Configuration 4 cont'd

Frequency (MHz)	Line	Reading (AV) (dBµV)	Correction Factor (dB)	Corrected Reading (AV) (dB)	Limit (AV) (dBµV)	Margin (AV) Limits (dB)
0.195	L1	29.64	10.89	40.53	53.80	-13.27
0.200	N	29.35	10.89	40.23	53.60	-13.37
0.303	L1	28.15	10.16	38.31	50.20	-11.89
0.380	N	33.03	10.05	43.08	48.30	-5.22
0.429	L1	33.80	9.97	43.77	47.30	-3.53
0.429	N	31.68	9.98	41.66	47.30	-5.64
0.803	L1	28.41	9.82	38.23	46.00	-7.78
0.830	N	30.29	9.82	40.11	46.00	-5.89
0.983	N	29.95	9.81	39.76	46.00	-6.24
1.221	L1	33.40	9.80	43.20	46.00	**-2.80**
1.379	N	27.76	9.81	37.57	46.00	-8.43
4.043	N	24.81	9.90	34.71	46.00	-11.29
4.074	L1	24.94	9.90	34.84	46.00	-11.16
5.474	N	22.99	9.91	32.91	50.00	-17.09
5.609	L1	24.27	9.91	34.18	50.00	-15.82
19.415	L1	16.14	10.21	26.35	50.00	-23.65

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak and the average detectors.
See figure 1-6 and figure 1-7 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

AC Conducted Emissions Test Graphs

Test Configuration 4

Figure 1-6: L1 lines

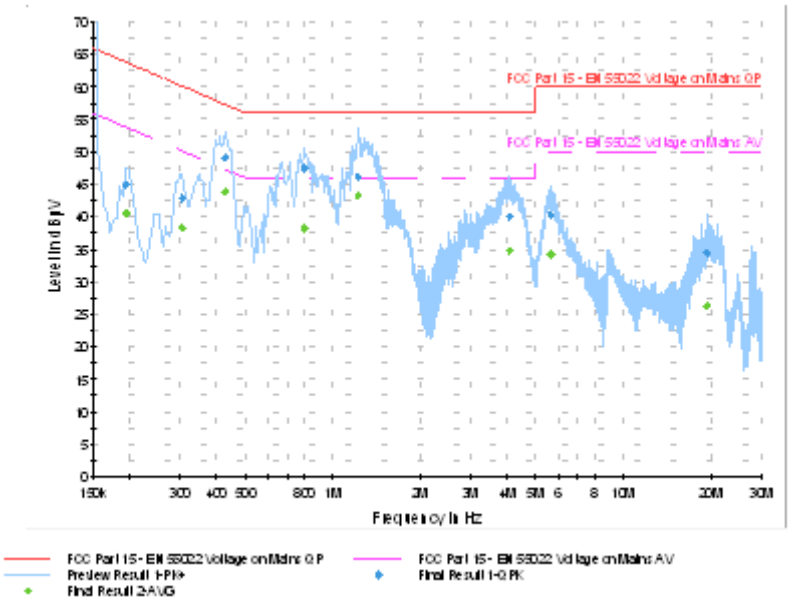
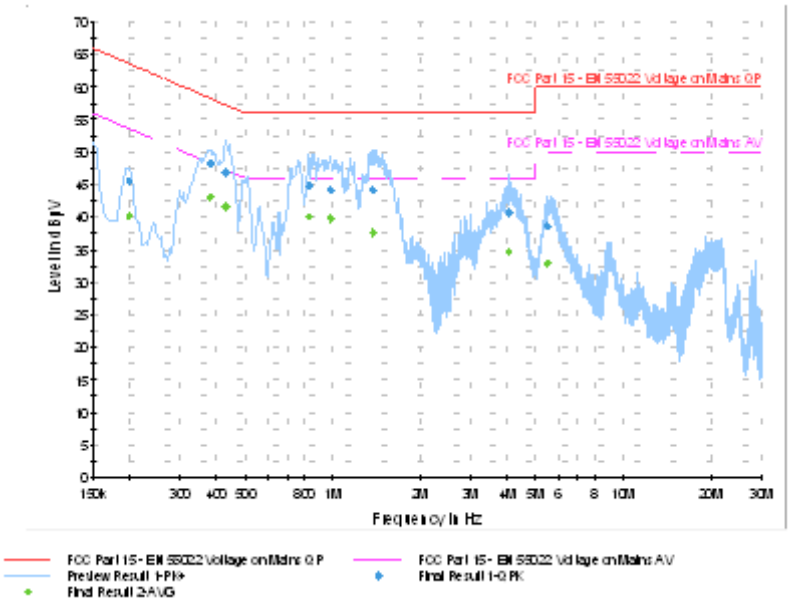


Figure 1-7: N Lines



APPENDIX 2 – BLUETOOTH, BLUETOOTH LOW ENERGY AND 802.11b/g/n RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
Bluetooth Band

Date of Test: June 28, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 26 ºC
Relative Humidity: 34 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone in Bluetooth Tx mode was in horizontal position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 39 and 78 using packet types "DH5", "2-DH5" and "3-DH5".

Frequency (MHz)	Channel	Packet Type	Antenna		Test Angle (Deg.)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
			Pol. (V/H)	Height (metres)						
517.730	0	DH5	V	3.14	242	34.94	4.30	39.24	46.00	-6.76
517.689	0	2DH5	H	3.38	106	34.80	4.31	39.11	46.00	-6.89
517.713	0	3DH5	V	2.20	354	35.01	4.31	39.32	46.00	-6.68
517.732	39	DH5	V	2.53	328	35.24	4.31	39.55	46.00	-6.45
517.730	39	2DH5	H	3.49	106	34.83	4.31	39.14	46.00	-6.86
517.725	39	3DH5	H	1.23	139	35.51	4.30	39.81	46.00	**-6.19**
517.732	78	DH5	V	1.60	101	34.12	4.31	38.43	46.00	-7.57
517.723	78	2DH5	V	2.46	166	34.91	4.30	39.21	46.00	-6.79
517.705	78	3DH5	V	4.00	69	34.56	4.31	38.87	46.00	-7.13

All other emissions had a test margin of greater than 25.0 dB.

Radiated Emissions Test Results cont'd
Bluetooth Band cont'd

Date of Test: June 25, 26 and July 09, 2012
Measurements were performed by Shuo Wang.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 42 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone in Bluetooth Tx mode was in horizontal down position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 39 and 78 using packet types "DH5", "2-DH5" and "3-DH5".

All emissions had a test margin of greater than 25.0 dB.

Band-Edge Compliance of RF Radiated Emissions Test Results
Bluetooth Band

Date of test: July 03, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25 º C
Relative Humidity: 31 %

The BlackBerry® smartphone was in standalone, horizontal position and pattern type "Static PBRS" in "DH5", "2-DH5" and "3-DH5" modulation during the measurements.

The test distance was 3.0 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, Packet Type DH5										
0	2402	Horn	V	PK	1 MHz	95.47	50.07	45.40	74.00	-28.60
0	2402	Horn	H	PK	1 MHz	99.62	56.03	43.59	74.00	-30.41
0	2402	Horn	V	AV	10 Hz	65.20	50.07	15.13	54.00	-38.87
0	2402	Horn	H	AV	10 Hz	67.46	56.03	11.43	54.00	-42.57
High Channel, Packet Type DH5										
78	2480	Horn	V	PK	1 MHz	91.70	53.99	37.71	74.00	-36.29
78	2480	Horn	H	PK	1 MHz	89.62	51.97	37.65	74.00	-36.35
78	2480	Horn	V	AV	10 Hz	63.61	53.99	9.62	54.00	-44.38
78	2480	Horn	H	AV	10 Hz	62.58	51.97	10.61	54.00	-43.39
Low Channel, Packet Type 2-DH5										
0	2402	Horn	V	PK	1 MHz	95.35	52.13	43.22	74.00	-30.78
0	2402	Horn	H	PK	1 MHz	93.55	48.68	44.87	74.00	-29.13
0	2402	Horn	V	AV	10 Hz	63.88	52.13	11.75	54.00	-42.25
0	2402	Horn	H	AV	10 Hz	62.97	48.68	14.29	54.00	-39.71
High Channel, Packet Type 2-DH5										
78	2480	Horn	V	PK	1 MHz	90.32	47.48	42.84	74.00	-31.16
78	2480	Horn	H	PK	1 MHz	94.97	46.85	48.12	74.00	-25.88
78	2480	Horn	V	AV	10 Hz	61.45	47.48	13.97	54.00	-40.03
78	2480	Horn	H	AV	10 Hz	64.12	46.85	17.27	54.00	-36.73

Band-Edge Compliance of RF Radiated Emissions Test Results cont'd
Bluetooth Band

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, Packet Type 3-DH5										
0	2402	Horn	V	PK	1 MHz	94.13	52.45	41.68	74.00	-32.32
0	2402	Horn	H	PK	1 MHz	93.42	51.62	41.80	74.00	-32.20
0	2402	Horn	V	AV	10 Hz	63.04	52.45	10.59	54.00	-43.41
0	2402	Horn	H	AV	10 Hz	62.70	51.62	11.08	54.00	-42.92
High Channel, Packet Type 3-DH5										
78	2480	Horn	V	PK	1 MHz	90.64	51.75	38.89	74.00	-35.11
78	2480	Horn	H	PK	1 MHz	95.11	48.01	47.10	74.00	-26.90
78	2480	Horn	V	AV	10 Hz	61.54	51.75	9.79	54.00	-44.21
78	2480	Horn	H	AV	10 Hz	63.94	48.01	15.93	54.00	-38.07

See figures 2-1 to 2-12 for the plots of the Bluetooth band-edge compliance.

Bluetooth Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-1: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, DH5, Channel 0, Pol: V, Detector: PK

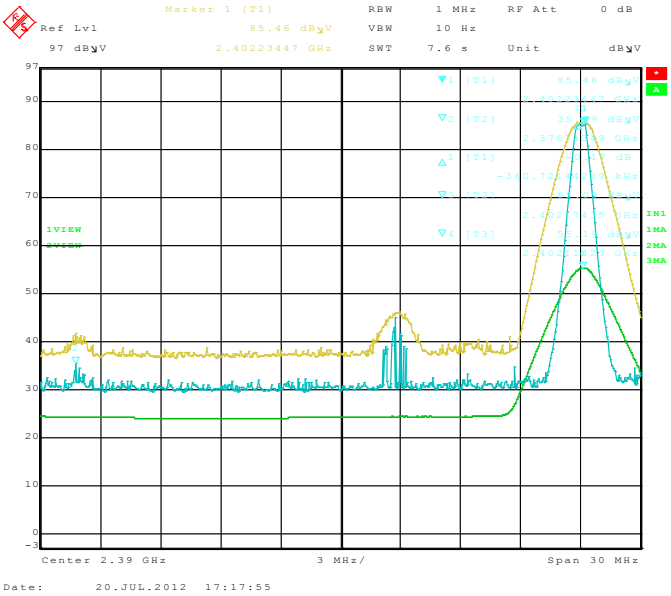


Figure 2-2: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, DH5, Channel 0, Pol: H, Detector: PK

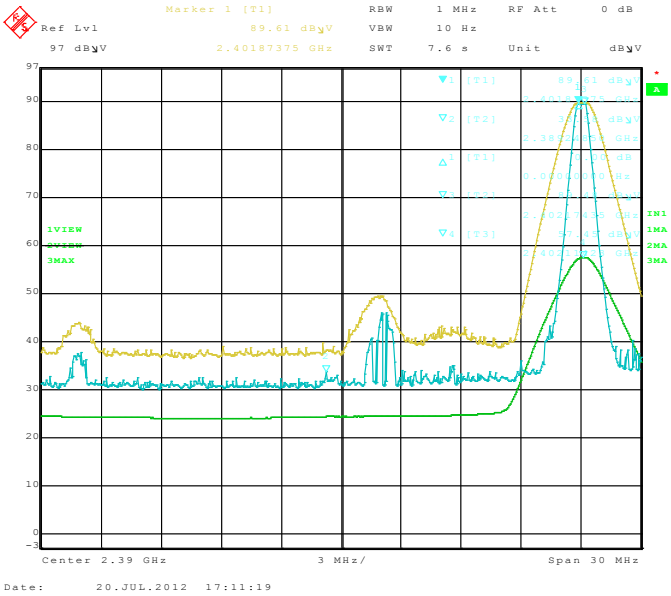


Figure 2-3: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, DH5, Channel 78, Pol: V, Detector: PK

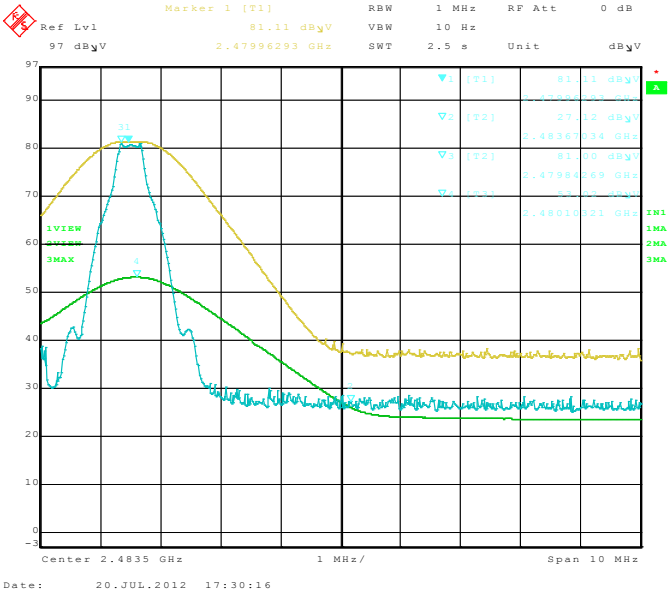
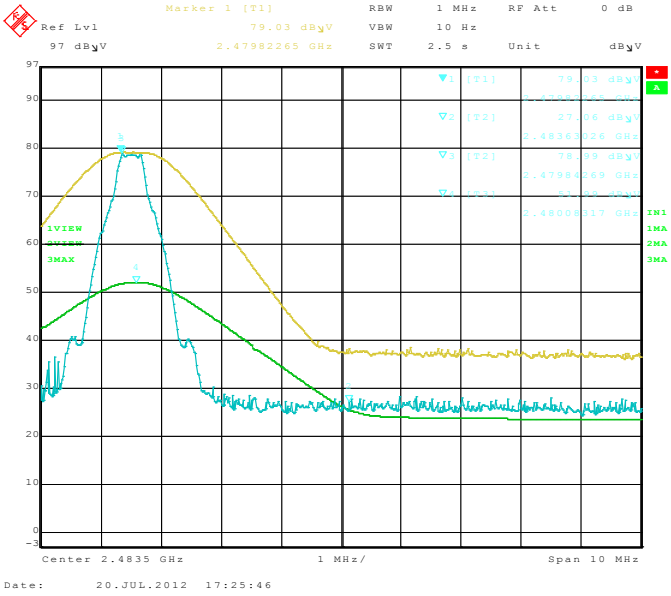


Figure 2-4: Band-Edge Compliance of RF Rad. Emissions Bluetooth, Single freq., Static PBRS, DH5, Channel 78, Pol: H, Detector: PK



Bluetooth Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-5: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 0, Pol: V, Detector: PK

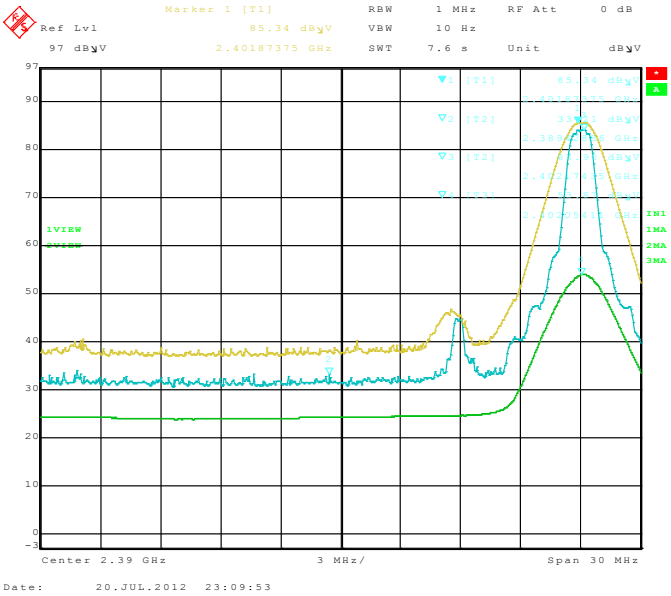


Figure 2-6: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 0, Pol: H, Detector: PK

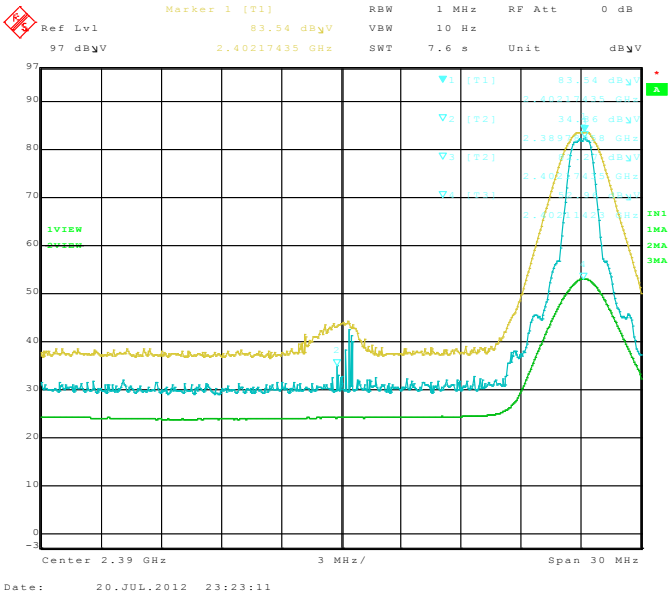


Figure 2-7: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 78, Pol: V, Detector: PK

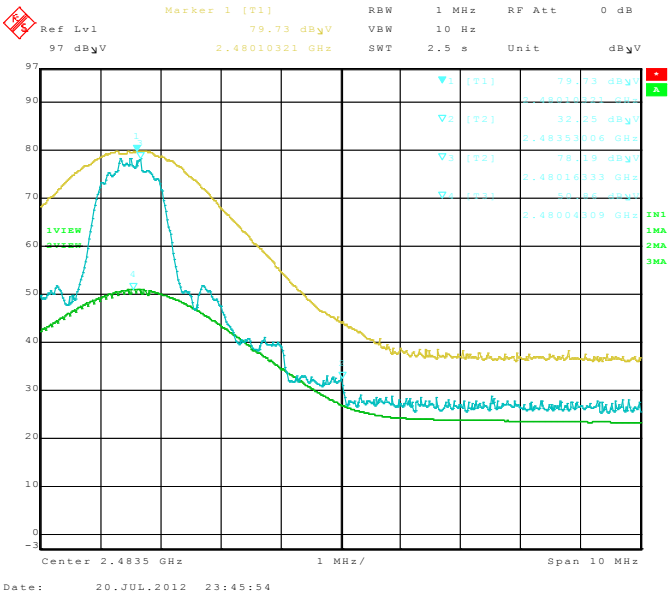
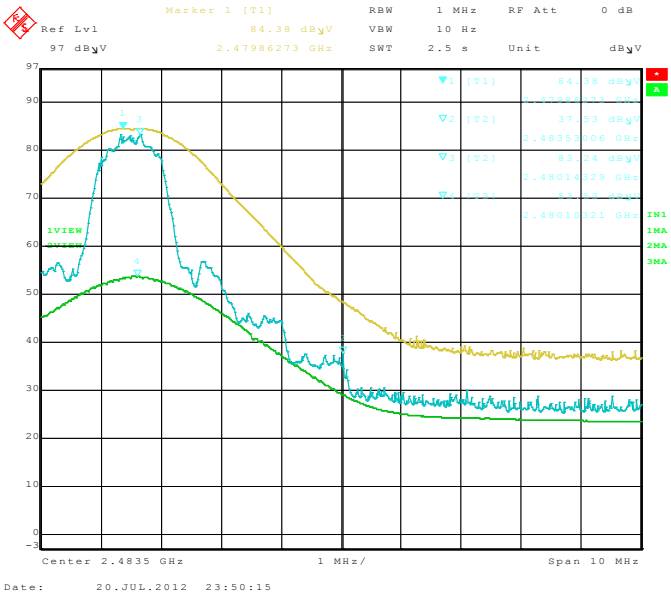


Figure 2-8: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 78, Pol: H, Detector: PK



Bluetooth Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-9: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: V, Detector: PK

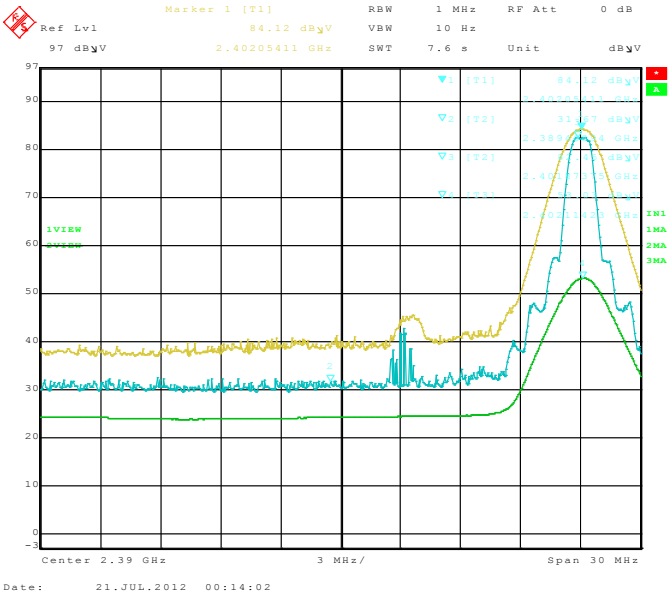


Figure 2-10: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: H, Detector: PK

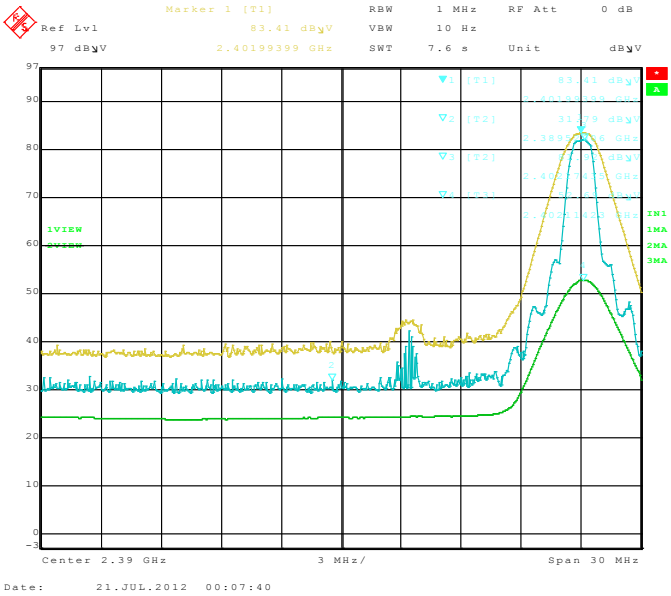


Figure 2-11: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: V, Detector: PK

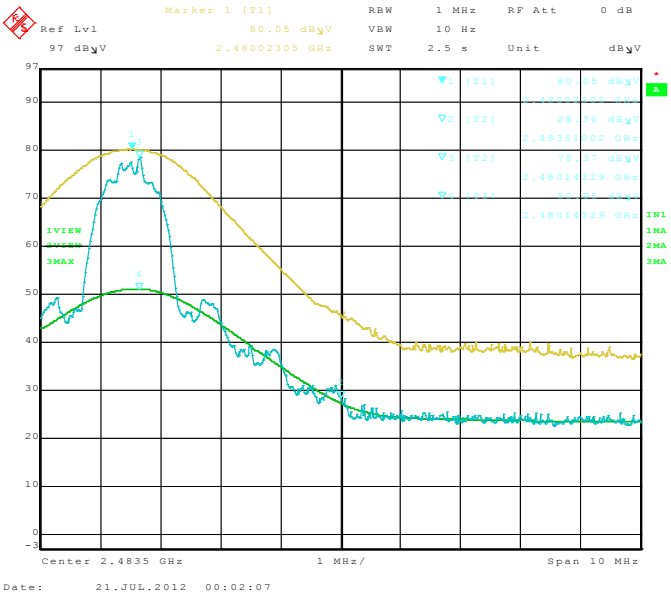
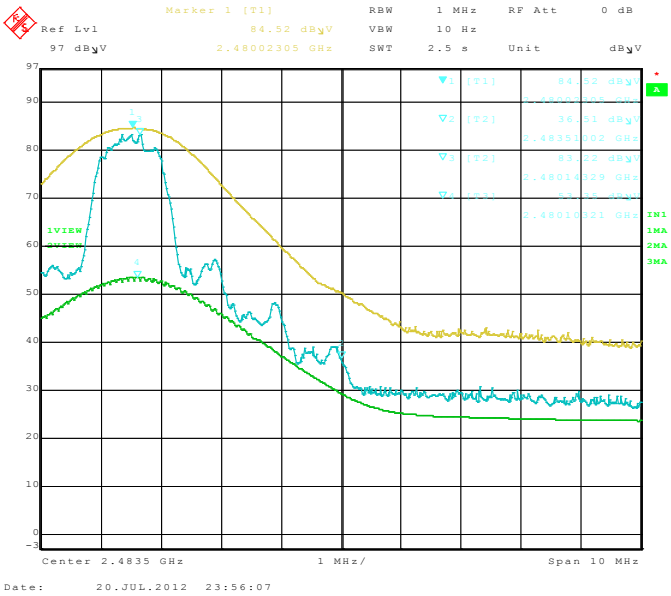


Figure 2-12: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: H, Detector: PK



Radiated Emissions Test Results cont'd
Bluetooth Low Energy Band

Date of Test: July 25, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 26 ºC
Relative Humidity: 32 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone in Bluetooth Low Energy Tx mode was in horizontal position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 20 and 39.

Frequency (MHz)	Channel	Antenna		Test Angle (Deg.)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
		Pol. (V/H)	Height (metres)						
517.730	0	H	3.20	7	34.12	1.62	35.74	46.00	**-10.26**
517.714	20	V	2.98	33	33.77	1.62	35.39	46.00	-10.61
517.672	39	V	2.54	128	32.08	1.61	33.69	46.00	-12.31

All other emissions had a test margin of greater than 25.0 dB.

Date of Test: July 20 and 25, 2012
Measurements were performed by Shuo Wang.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 42 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone in Bluetooth Low Energy Tx mode was in horizontal down position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 20 and 39.

All emissions had a test margin of greater than 25.0 dB.

Band-Edge Compliance of RF Radiated Emissions Test Results
Bluetooth Low Energy Band

Date of test: July 03, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25 º C
Relative Humidity: 31 %

The BlackBerry® smartphone was in horizontal position.

The test distance was 3.0 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, LE										
0	2402	Horn	V	PK	1 MHz	94.69	38.71	55.98	74.00	-18.02
0	2402	Horn	H	PK	1 MHz	94.27	41.08	53.19	74.00	-20.81
0	2402	Horn	V	AV	10 Hz	73.53	38.71	34.82	54.00	-19.18
0	2402	Horn	H	AV	10 Hz	73.05	41.08	31.97	54.00	-22.03
High Channel, LE										
39	2441	Horn	V	PK	1 MHz	92.14	46.02	46.12	74.00	-27.88
39	2441	Horn	H	PK	1 MHz	89.43	45.39	44.04	74.00	-29.96
39	2441	Horn	V	AV	10 Hz	71.05	46.02	25.03	54.00	-28.97
39	2441	Horn	H	AV	10 Hz	69.12	45.39	23.73	54.00	-30.27

See figures 2-13 to 2-16 for the plots of the Bluetooth Low Energy band-edge compliance.

Bluetooth Low Energy Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-13: Band-Edge Compliance of RF Rad. Emissions. Bluetooth Low Energy, Single freq., LE, Channel 0, Pol: V, Detector: PK

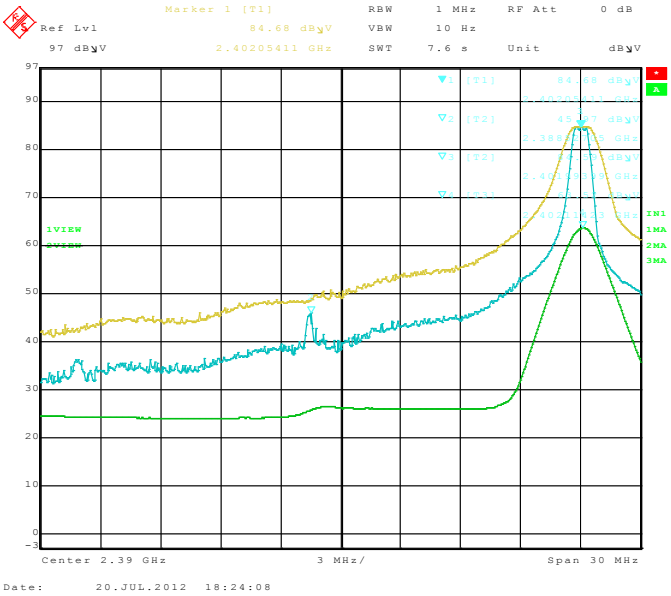


Figure 2-14: Band-Edge Compliance of RF Rad. Emissions. Bluetooth Low Energy, Single freq., LE, Channel 0, Pol: H, Detector: PK

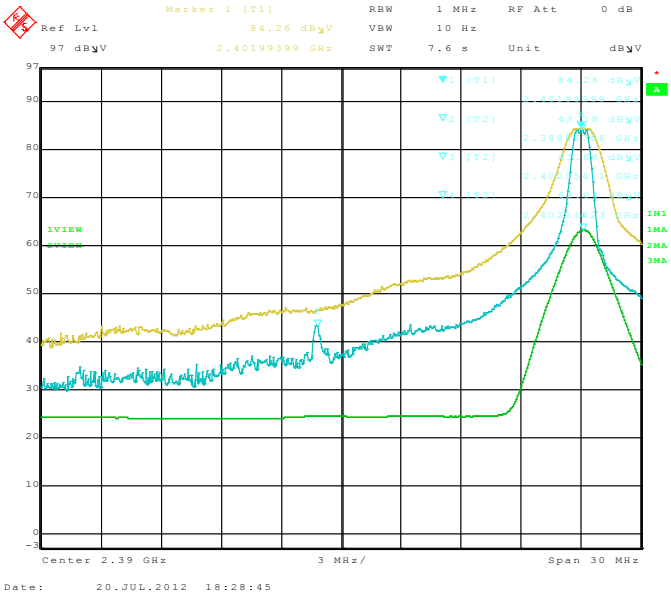


Figure 2-15: Band-Edge Compliance of RF Rad. Emissions. Bluetooth Low Energy, Single freq., LE, Channel 39, Pol: V, Detector: PK

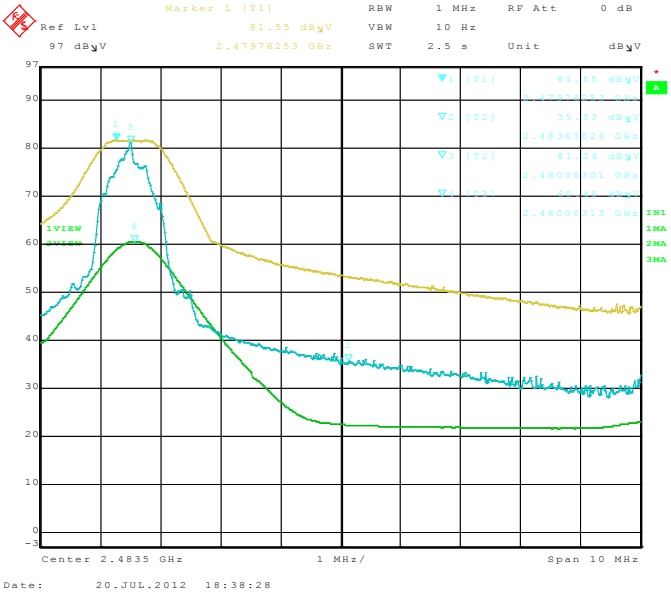
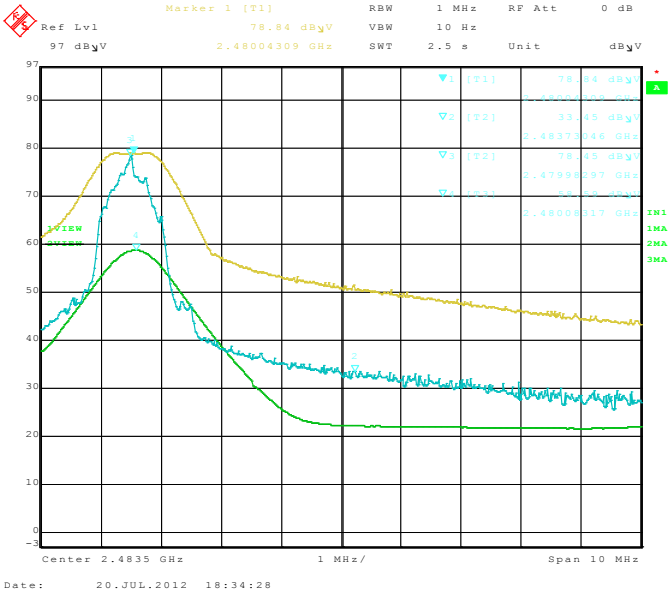


Figure 2-16: Band-Edge Compliance of RF Rad. Emissions Bluetooth Low Energy, Single freq., LE, Channel 39, Pol: H, Detector: PK



Radiated Emissions Test Results cont'd
802.11b/g/n Band

Date of Test: June 27 and September 18, 2012
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 34 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in USB up position.

The frequency sweep measurements were performed in 802.11b Tx mode at 1 Mbps on channels 1, 6 and 11, in 802.11g Tx mode at 6 Mbps on channels 1, 6 and 11, and in 802.11n Tx mode at MCS 0 on channels 1, 6 and 11.

All emissions had a test margin of greater than 25.0 dB.

Date of Test: June 22, 26, 28, July 10 and October 11, 2012
Measurements performed by Shuo Wang.

The environmental test conditions were: Temperature: 24 - 25 ºC
Relative Humidity: 38 - 42 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11b Tx mode at 1 Mbps on channels 1, 6 and 11, in 802.11g Tx mode at 6 Mbps on channels 1, 6 and 11, and in 802.11n Tx mode at MCS 0 on channels 1, 6 and 11.

All emissions had a test margin of greater than 25.0 dB.

802.11b/g/n Band-Edge Compliance of RF Radiated Emissions

Date of Tests: September 18, 2012
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 34 %

802.11b Band

The measurements were performed on BlackBerry® smartphone in standalone, USB up configuration on channels 1 and 11 for 802.11b mode at 1 Mbps.

The test distance was 3 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
1	2412.00	Horn	V	PK	1 MHz	102.92	51.28	51.64	74.00	-22.36
1	2412.00	Horn	H	PK	1 MHz	102.82	52.06	50.76	74.00	-23.24
1	2412.00	Horn	V	AV	10 Hz	99.02	57.79	41.23	54.00	-12.77
1	2412.00	Horn	H	AV	10 Hz	98.90	58.33	40.57	54.00	-13.43

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
11	2480.00	Horn	V	PK	1 MHz	104.49	53.45	51.04	74.00	-22.96
11	2480.00	Horn	H	PK	1 MHz	105.52	51.21	54.31	74.00	-19.69
11	2480.00	Horn	V	AV	10 Hz	100.62	60.26	40.36	54.00	-13.64
11	2480.00	Horn	H	AV	10 Hz	101.73	57.59	44.14	54.00	-9.86

802.11g Band

The measurements were performed on the BlackBerry® smartphone in standalone, USB up configuration on channels 1 and 11 for 802.11g mode at 6 Mbps.

The test distance was 3 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
1	2412.00	Horn	V	PK	1 MHz	100.56	46.25	54.31	74.00	-19.69
1	2412.00	Horn	H	PK	1 MHz	100.55	46.35	54.20	74.00	-19.80
1	2412.00	Horn	V	AV	10 Hz	87.38	48.59	38.79	54.00	-15.21
1	2412.00	Horn	H	AV	10 Hz	87.14	49.02	38.12	54.00	-15.88

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
11	2480.00	Horn	V	PK	1 MHz	101.66	48.41	53.25	74.00	-20.75
11	2480.00	Horn	H	PK	1 MHz	97.80	47.27	50.53	74.00	-23.47
11	2480.00	Horn	V	AV	10 Hz	89.64	50.19	39.45	54.00	-14.55
11	2480.00	Horn	H	AV	10 Hz	85.28	47.46	37.82	54.00	-16.18

802.11n Band

The measurements were performed on the BlackBerry® smartphone in standalone, USB up configuration on channels 1 and 11 for 802.11n mode at MCS 0.

The test distance was 3 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
1	2412.00	Horn	V	PK	1 MHz	100.95	47.48	53.47	74.00	-20.53
1	2412.00	Horn	H	PK	1 MHz	100.56	46.43	54.13	74.00	-19.87
1	2412.00	Horn	V	AV	10 Hz	85.60	46.99	38.61	54.00	-15.39
1	2412.00	Horn	H	AV	10 Hz	85.05	47.19	37.86	54.00	-16.14

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
11	2480.00	Horn	V	PK	1 MHz	103.34	49.74	53.60	74.00	-20.40
11	2480.00	Horn	H	PK	1 MHz	97.46	45.95	51.51	74.00	-22.49
11	2480.00	Horn	V	AV	10 Hz	88.10	48.49	39.61	54.00	-14.39
11	2480.00	Horn	H	AV	10 Hz	82.61	44.80	37.81	54.00	-16.19

See figures 2-17 to 2-20 for the plots of the 802.11b band-edge compliance.
See figures 2-21 to 2-24 for the plots of the 802.11g band-edge compliance.
See figures 2-25 to 2-28 for the plots of the 802.11n band-edge compliance.

802.11b/g/n Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-17: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

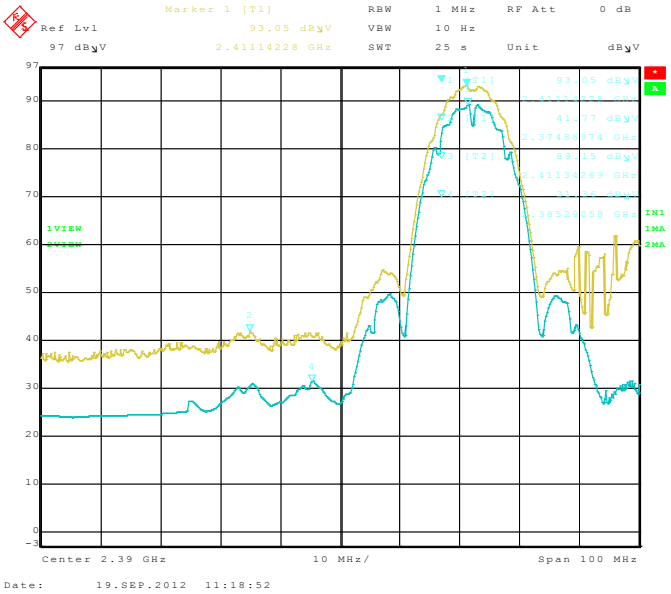


Figure 2-18: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

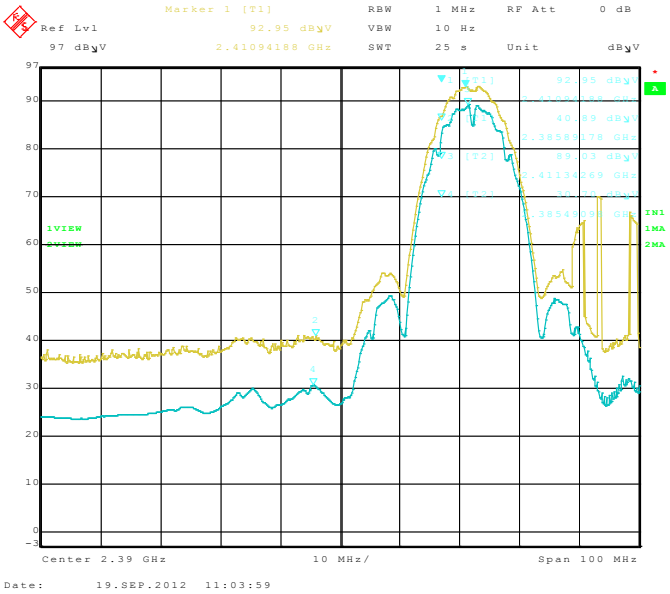


Figure 2-19: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

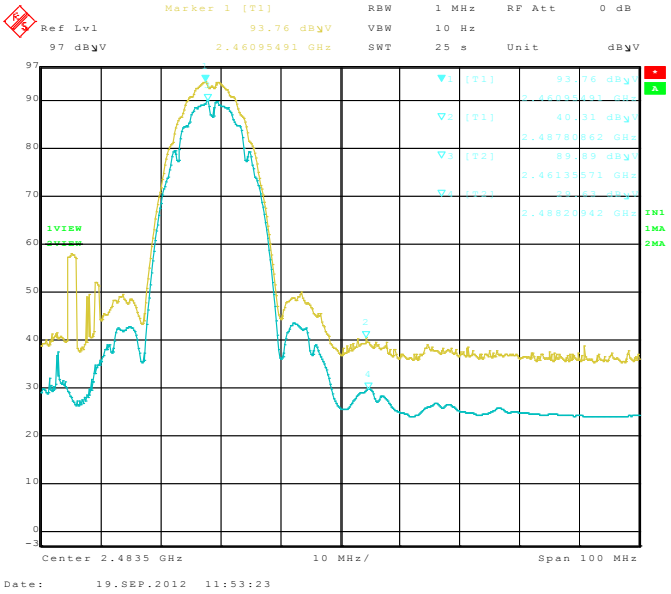


Figure 2-20: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

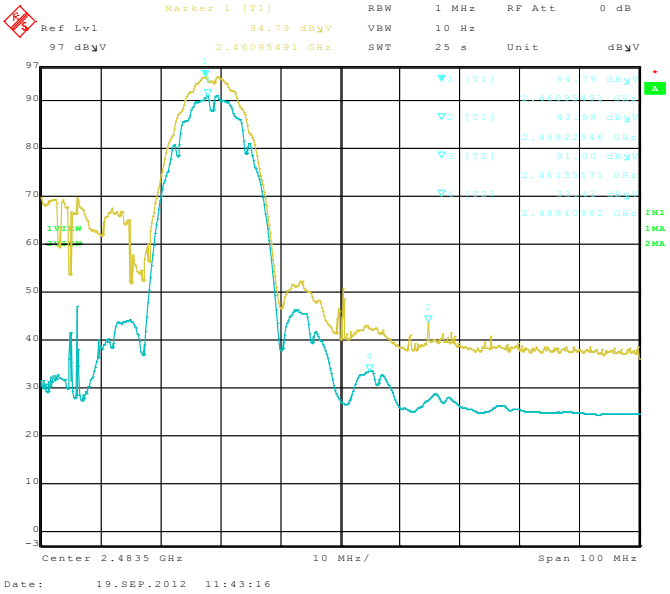


Figure 2-21: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

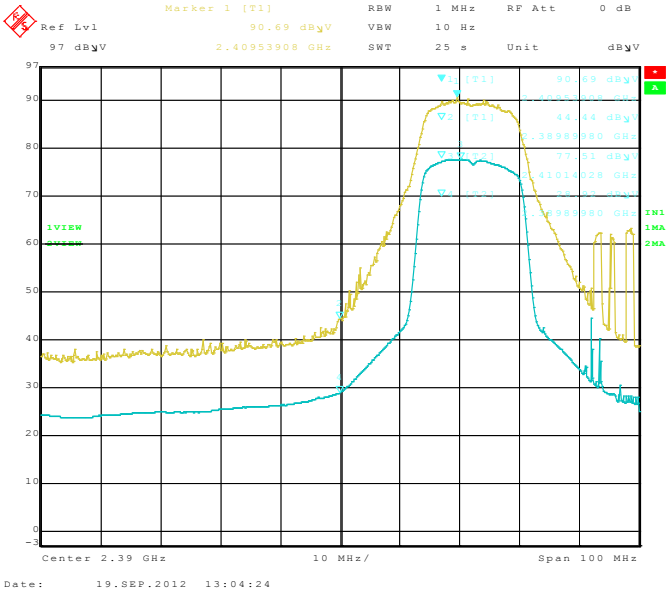


Figure 2-22: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

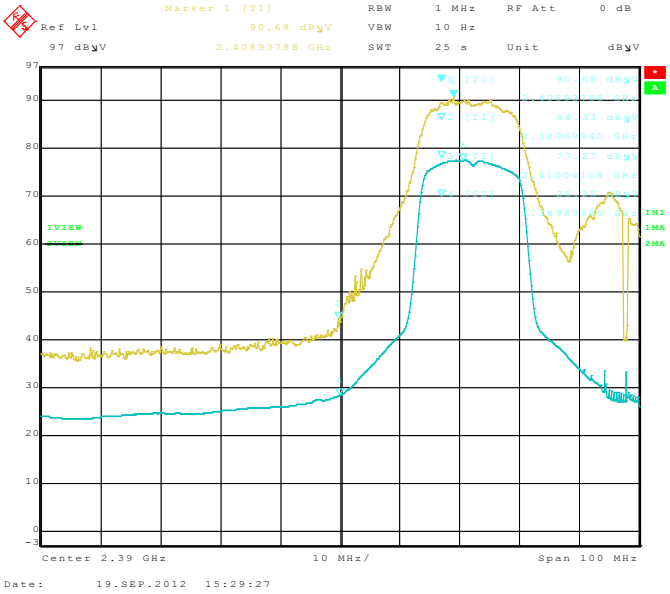


Figure 2-23: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

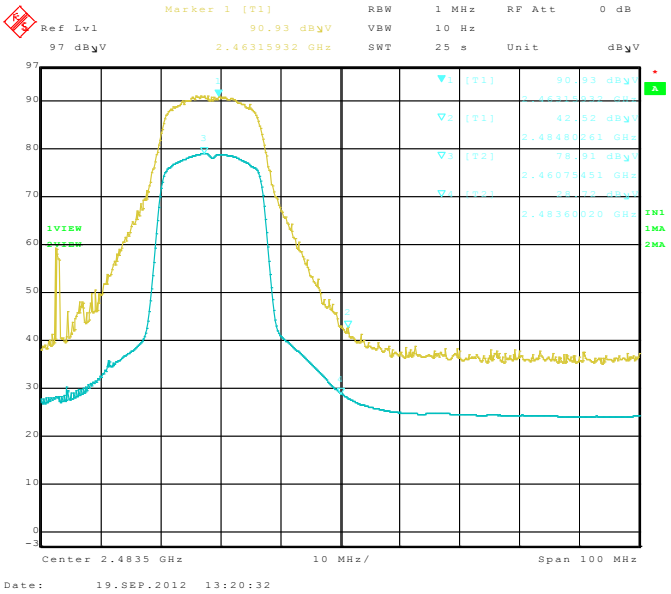


Figure 2-24: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

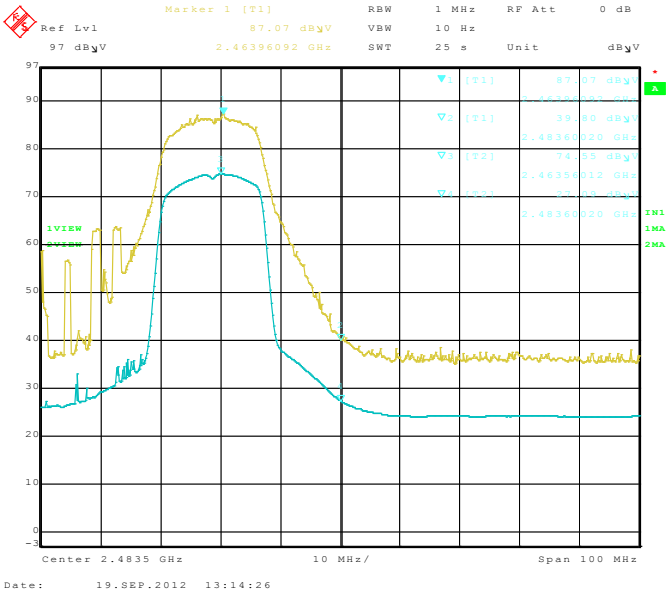


Figure 2-25: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

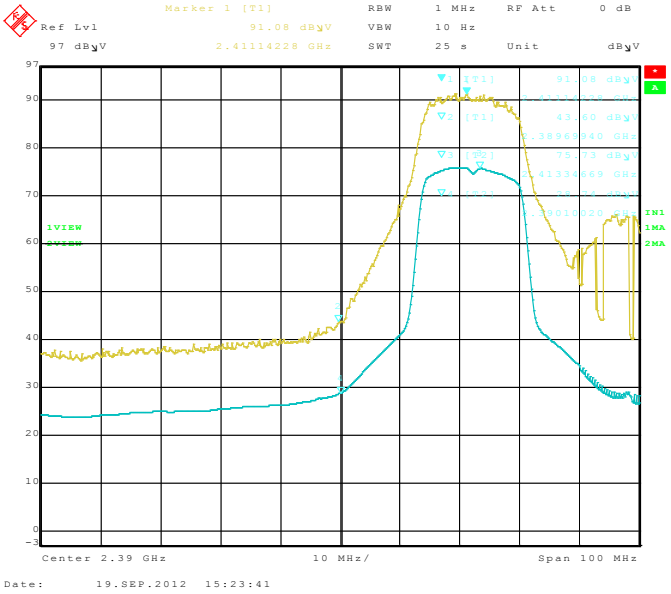


Figure 2-26: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

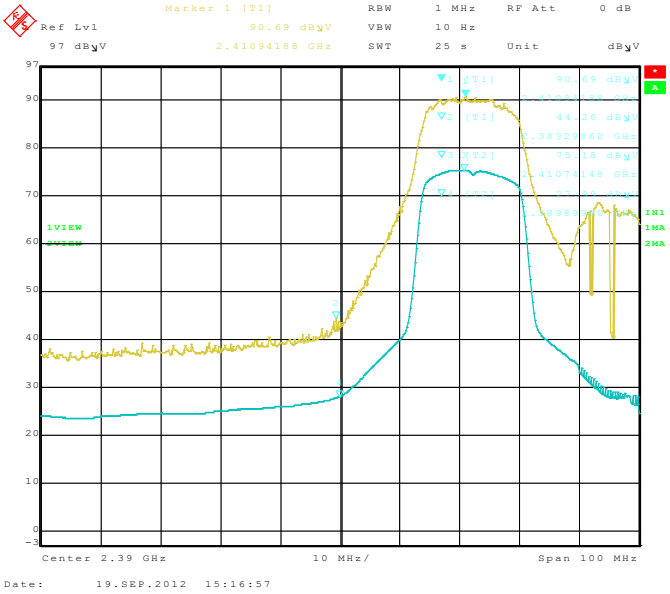


Figure 2-27: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

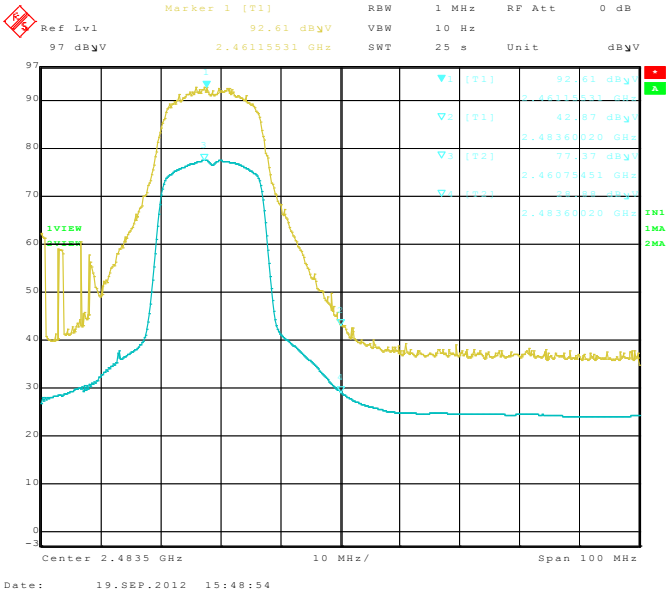
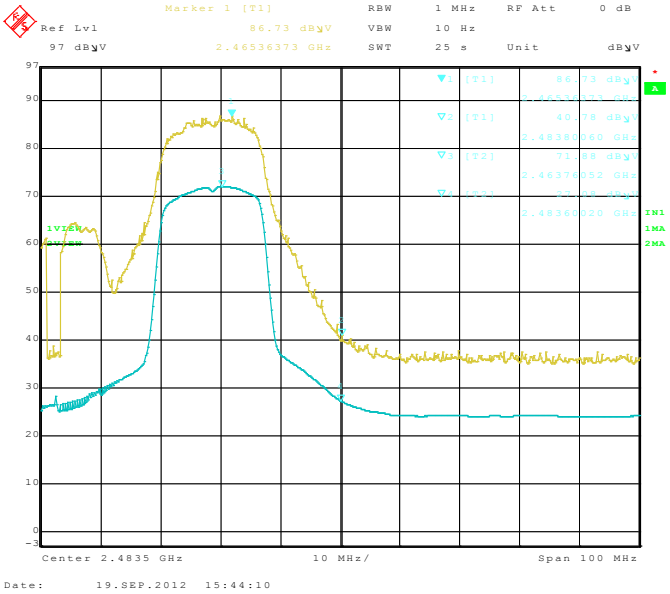


Figure 2-28: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: H, Detector: PK



APPENDIX 3 – 802.11a/n RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
802.11a Band

Date of Test: July 05 and September 18, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 34 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in USB up position.

The frequency sweep measurements were performed in 802.11a Tx mode at 6 Mbps on channels 36, 48, 64, 100, 140 and 165.

All emissions had a test margin of greater than 25.0 dB.

Date of Test: June 26, 28, July 10 and October 11, 2010
Measurements were performed by Shuo Wang.

The environmental test conditions were: Temperature: 24 - 25 ºC
Relative Humidity: 38 - 42 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11a Tx mode at 6 Mbps on channels 36, 48, 64, 100, 140 and 165.

All emissions had a test margin of greater than 25.0 dB.

Radiated Emissions Test Results cont'd
802.11n Band

Date of Test: October 30, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 34 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in USB up position.

The frequency sweep measurements were performed in 802.11n Tx mode at MCS 0 on channels 36, 48, 64, 100, 140 and 165.

All emissions had a test margin of greater than 25.0 dB.

Date of Test: October 30, 2010
Measurements were performed by Heng Lin.

The environmental test conditions were: Temperature: 24 - 25 ºC
Relative Humidity: 38 - 42 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11n Tx mode at MCS 0 on channels 36, 48, 64, 100, 140 and 165.

All emissions had a test margin of greater than 25.0 dB.

802.11a Band-Edge Compliance of RF Radiated Emissions

Date of Tests: July 10, 2012
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 31 %

The measurements were performed on BlackBerry® smartphone in standalone, USB up configuration on channels 36, 64, 100, 140, 149 and 165 for 802.11a mode at 6 Mbps.

The test distance was 3 metres.

Centre at Band-Edge: 5150 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
36	5180.0	Horn	V	PK	1 MHz	105.97	41.48	64.49	74.00	-9.51
36	5180.0	Horn	H	PK	1 MHz	104.22	38.84	65.38	74.00	-8.62
36	5180.0	Horn	V	AV	10 Hz	93.38	43.23	50.15	54.00	-3.85
36	5180.0	Horn	H	AV	10 Hz	91.88	41.95	49.93	54.00	-4.07

Centre at Band-Edge: 5350 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
64	5320.0	Horn	V	PK	1 MHz	107.55	43.60	63.95	74.00	-10.05
64	5320.0	Horn	H	PK	1 MHz	106.18	43.61	62.57	74.00	-11.43
64	5320.0	Horn	V	AV	10 Hz	94.86	46.71	48.15	54.00	-5.85
64	5320.0	Horn	H	AV	10 Hz	93.29	45.55	47.74	54.00	-6.26

Centre at Band-Edge: 5460 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
100	5500.0	Horn	V	PK	1 MHz	103.16	37.42	65.74	74.00	-8.26
100	5500.0	Horn	H	PK	1 MHz	104.57	39.96	64.61	74.00	-9.39

100	5500.0	Horn	V	AV	10 Hz	90.70	41.52	49.18	54.00	-4.82
100	5500.0	Horn	H	AV	10 Hz	92.16	42.74	49.42	54.00	-4.58

802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Centre at Band-Edge: 5725 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
140	5700.0	Horn	V	PK	1 MHz	103.55	40.58	62.97	68.20	-5.23
140	5700.0	Horn	H	PK	1 MHz	104.21	41.16	63.05	68.20	-5.15

Centre at Band-Edge: 5725 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
149	5745.0	Horn	V	PK	1 MHz	105.70	33.93	71.77	78.20	-6.43
149	5745.0	Horn	H	PK	1 MHz	102.92	33.70	69.22	78.20	-8.98

Centre at Band-Edge: 5715 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
149	5745.0	Horn	V	PK	1 MHz	105.70	42.16	63.54	68.20	-4.66
149	5745.0	Horn	H	PK	1 MHz	102.92	41.20	61.72	68.20	-6.48

Centre at Band-Edge: 5805 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Remarks
	(MHz)	Type	POL.			(dBuV/m)	(dBc)	
165	5825.0	Horn	V	PK	1 MHz	102.63	38.24	No restricted band on border; 20dBc requirement valid instead
165	5825.0	Horn	H	PK	1 MHz	97.91	34.50	

Centre at Band-Edge: 5850 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Remarks
	(MHz)	Type	POL.			(dBuV/m)	(dBc)	
165	5825.0	Horn	V	PK	1 MHz	102.63	39.08	No restricted band on border;

165	5825.0	Horn	H	PK	1 MHz	97.91	34.23	20dBc requirement valid instead

802.11n Band-Edge Compliance of RF Radiated Emissions

Date of Tests: October 30, 2012
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 31 %

The measurements were performed on BlackBerry® smartphone in standalone, USB up configuration on channels 36, 64 and 165 for 802.11n mode at MCS 0.

The test distance was 3 metres.

Centre at Band-Edge: 5150 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
36	5180.0	Horn	V	PK	1 MHz	102.98	41.07	61.91	74.00	-12.09
36	5180.0	Horn	H	PK	1 MHz	102.94	41.24	61.70	74.00	-12.30
36	5180.0	Horn	V	AV	10 Hz	90.39	42.23	48.16	54.00	-5.84
36	5180.0	Horn	H	AV	10 Hz	89.86	41.78	48.08	54.00	-5.92

Centre at Band-Edge: 5350 MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
64	5320.0	Horn	V	PK	1 MHz	104.69	42.07	62.62	74.00	-11.38
64	5320.0	Horn	H	PK	1 MHz	103.60	41.20	62.40	74.00	-11.60
64	5320.0	Horn	V	AV	10 Hz	92.39	42.83	49.56	54.00	-4.44
64	5320.0	Horn	H	AV	10 Hz	91.27	41.77	49.50	54.00	-4.50

802.11n Band-Edge Compliance of RF Radiated Emissions cont'd

Centre at Band-Edge: 5805 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dBc)	Remarks
165	5825.0	Horn	V	PK	1 MHz	99.51	34.47	No restricted band on border; 20dBc requirement valid instead
165	5825.0	Horn	H	PK	1 MHz	98.56	33.02	

Centre at Band-Edge: 5850 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dBc)	Remarks
165	5825.0	Horn	V	PK	1 MHz	99.51	32.95	No restricted band on border; 20dBc requirement valid instead
165	5825.0	Horn	H	PK	1 MHz	98.56	32.97	

See figures 3-1 to 3-16 for the plots of the 802.11a band-edge compliance and figures 3-17 to 3-24 for the plots of the 802.11n band-edge.

802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-1: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

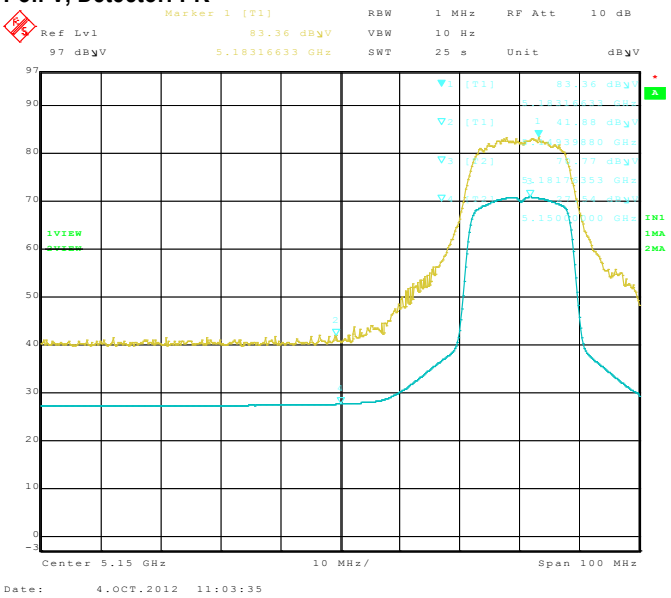


Figure 3-2: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

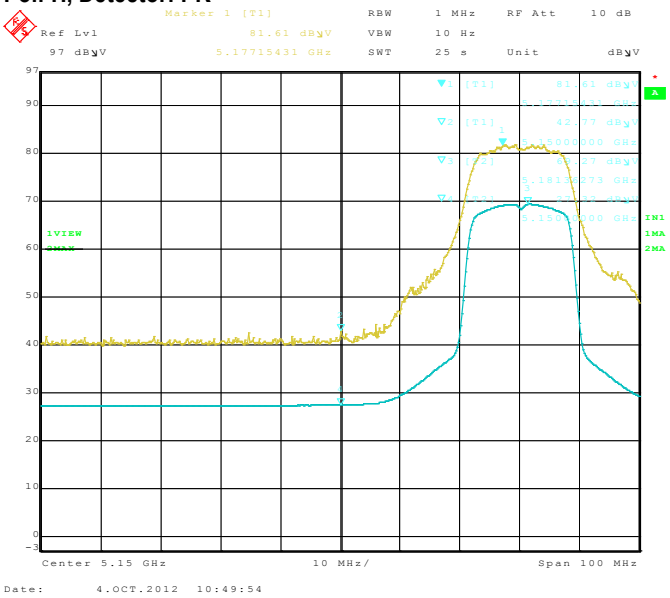
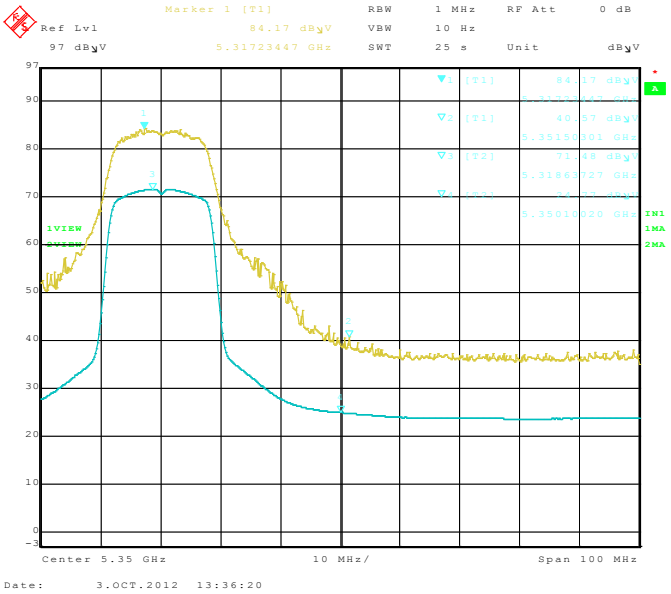
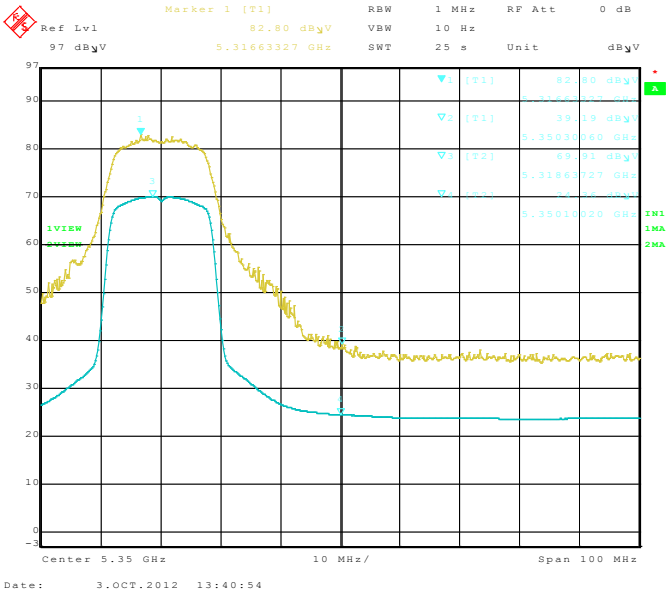


Figure 3-3: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

Figure 3-4: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK





802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-5: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: V, Detector: PK

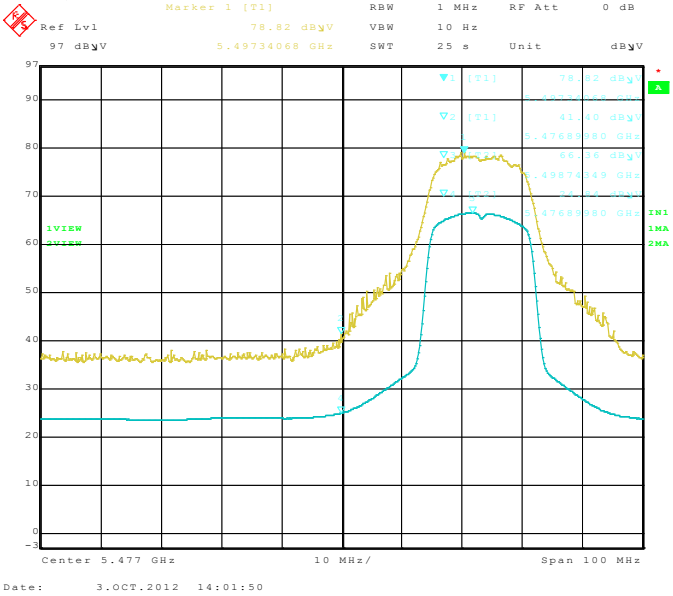


Figure 3-6: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK

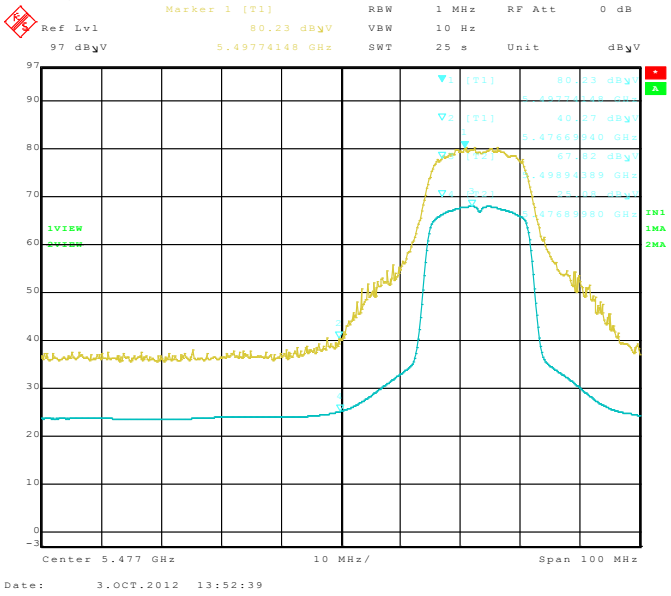


Figure 3-7: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

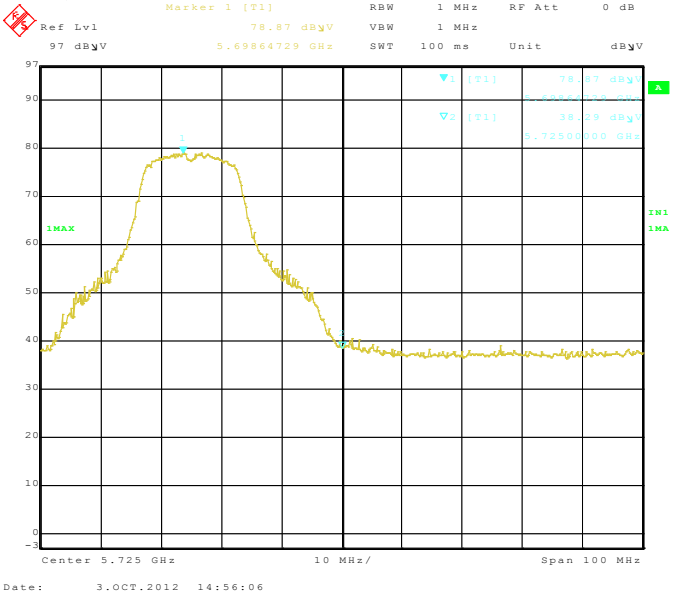
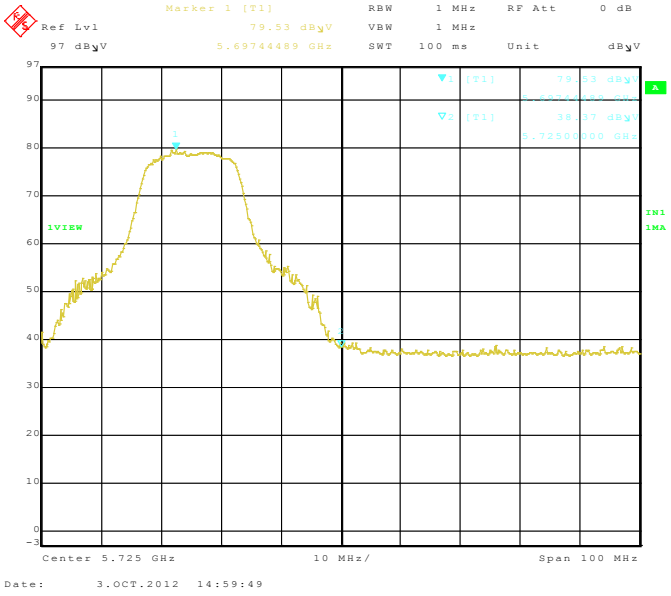


Figure 3-8: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK



802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-9: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

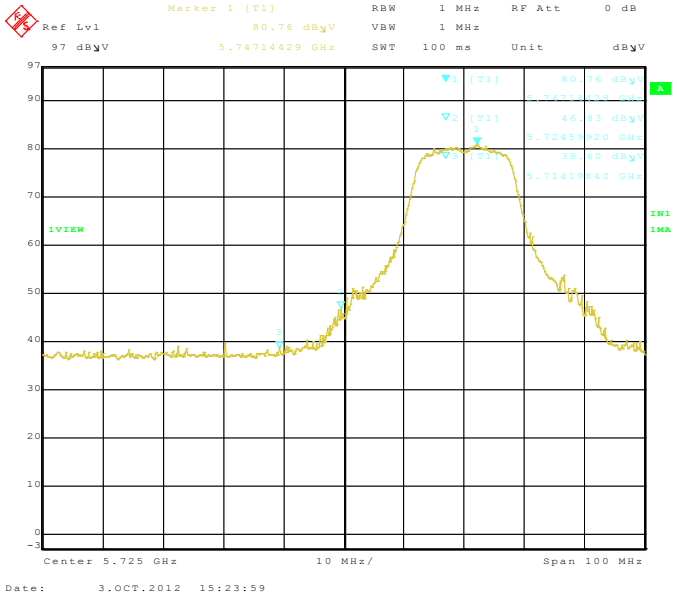


Figure 3-10: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK

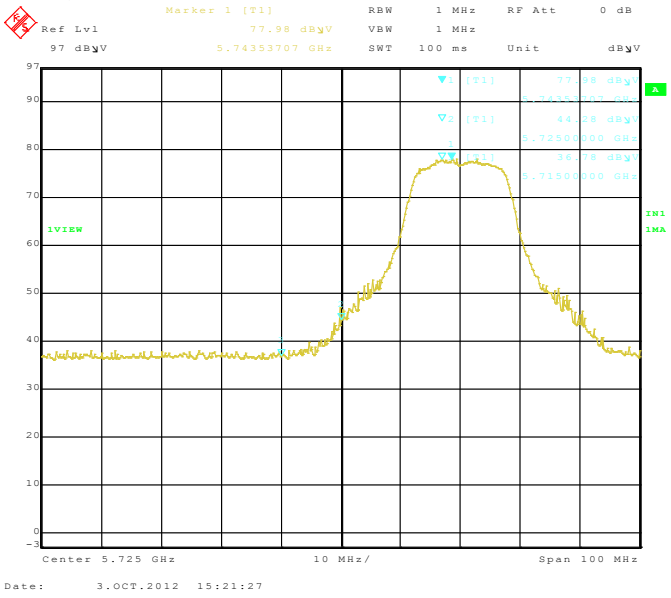


Figure 3-11: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5715 MHz Pol: V, Detector: PK

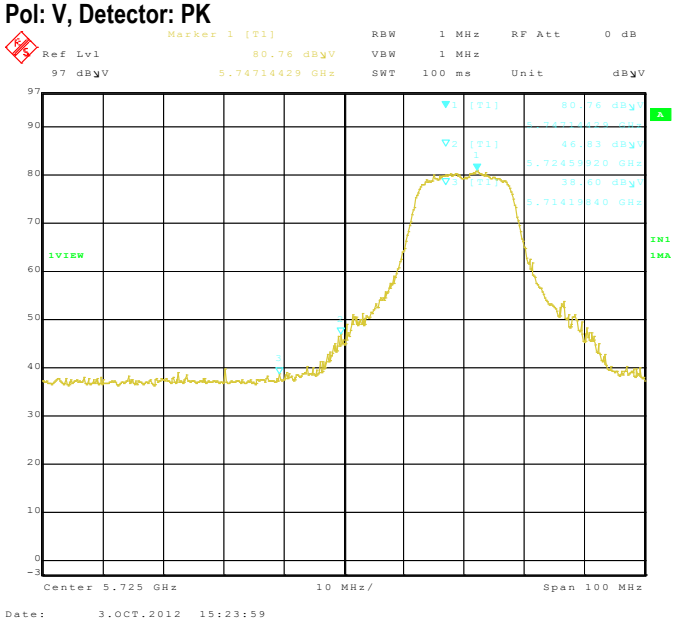
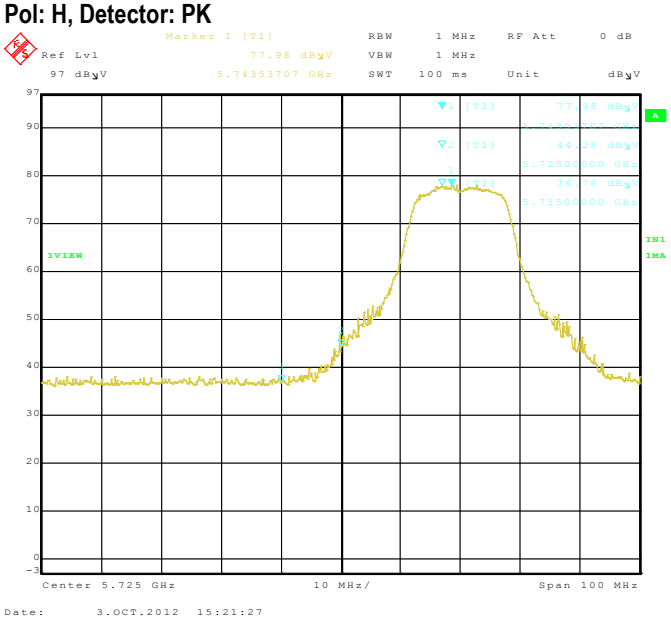


Figure 3-12: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5715 MHz Pol: H, Detector: PK



802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-13: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz Pol: V, Detector: PK

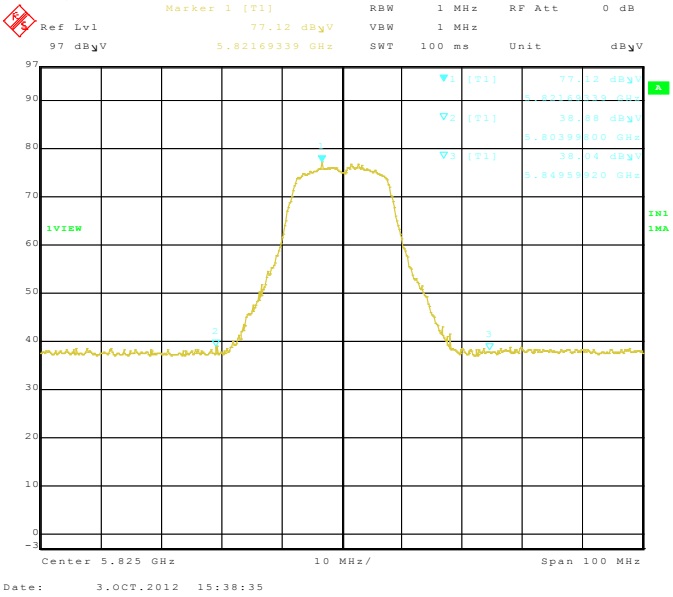


Figure 3-14: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz Pol: H, Detector: PK

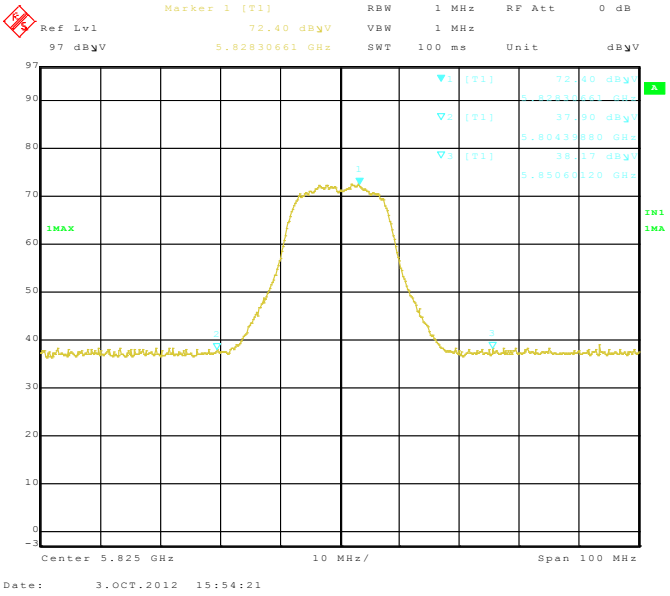
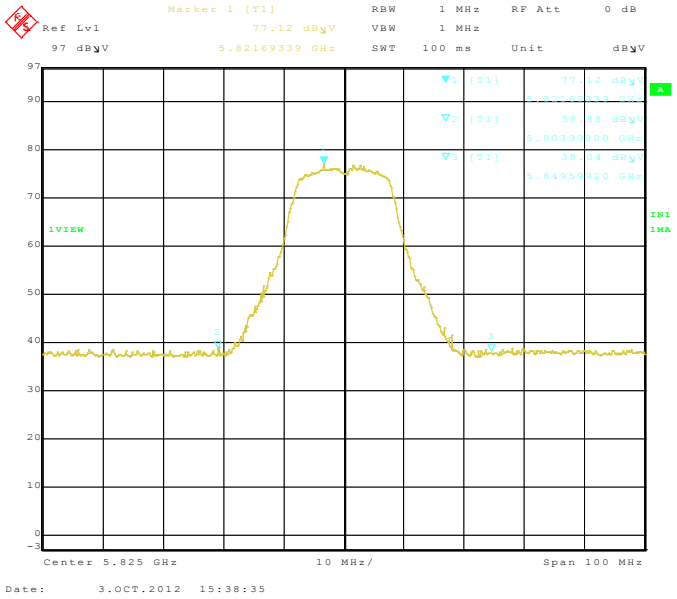
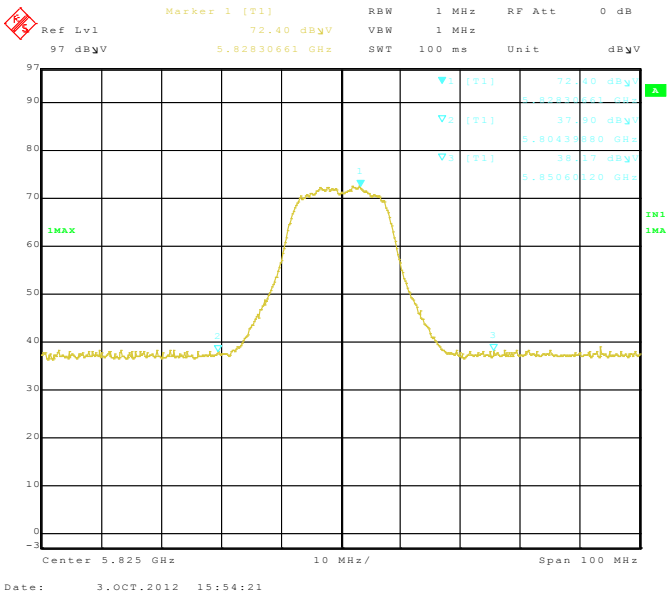


Figure 3-15: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz Pol: V, Detector: PK

Figure 3-16: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz Pol: H, Detector: PK

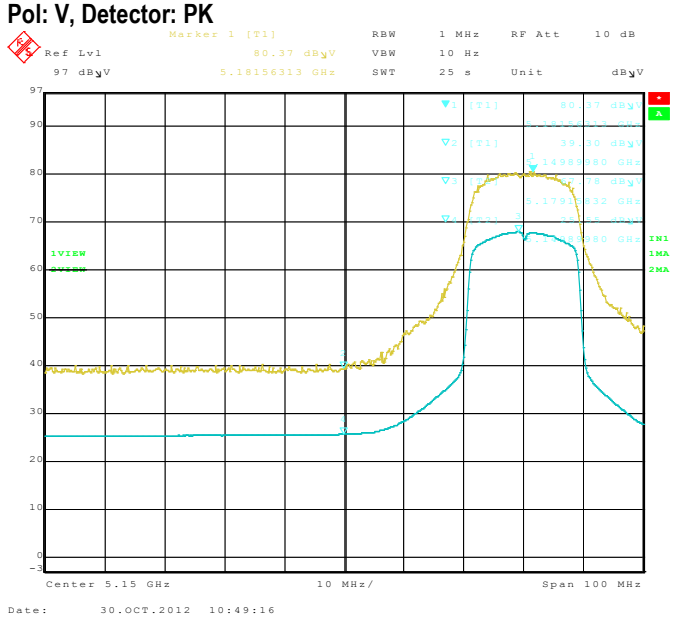




802.11n Band-Edge Compliance of RF Radiated Emissions

Figure 3-17: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

Figure 3-18: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK



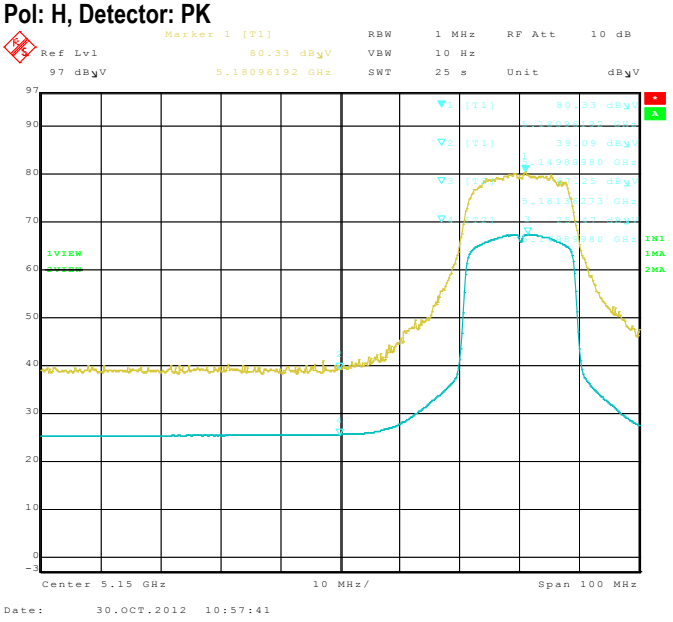
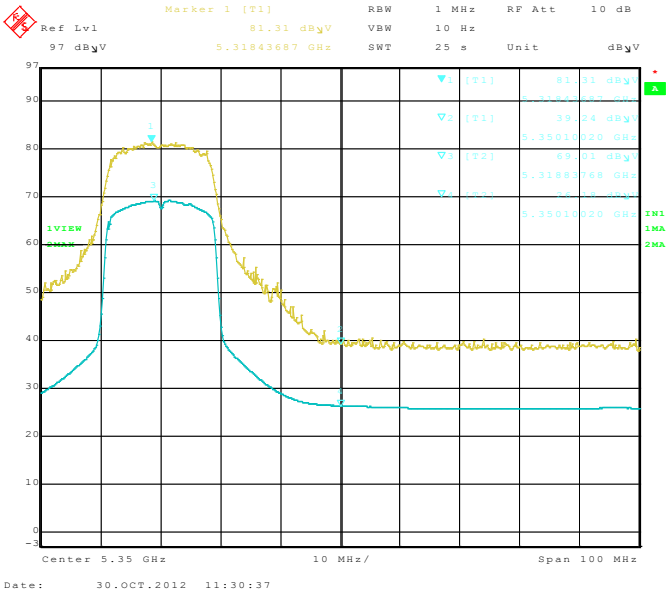
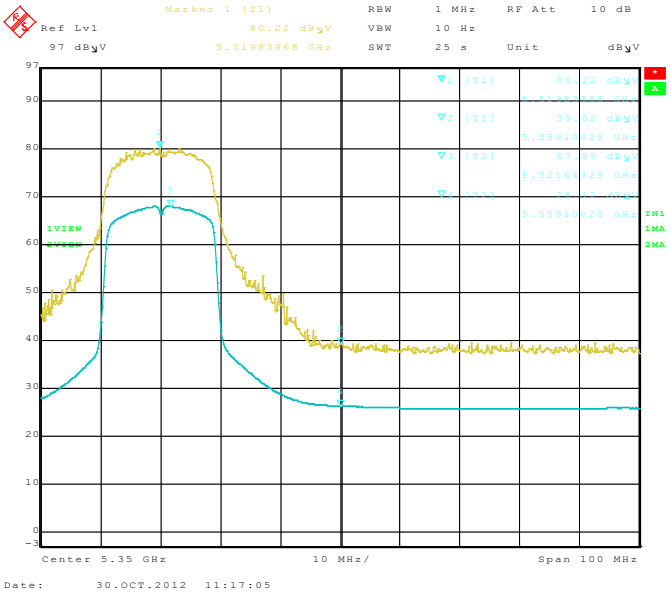


Figure 3-19: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

Figure 3-20: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK

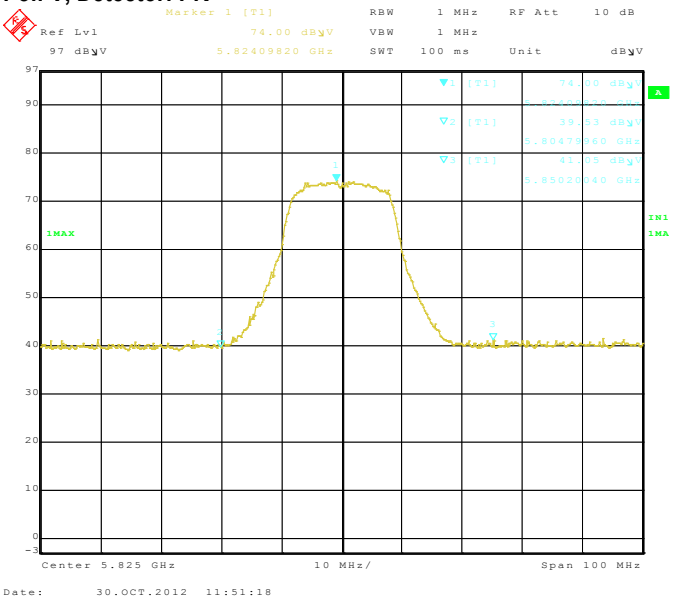




802.11n Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-21: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz Pol: V, Detector: PK

Figure 3-22: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz Pol: H, Detector: PK



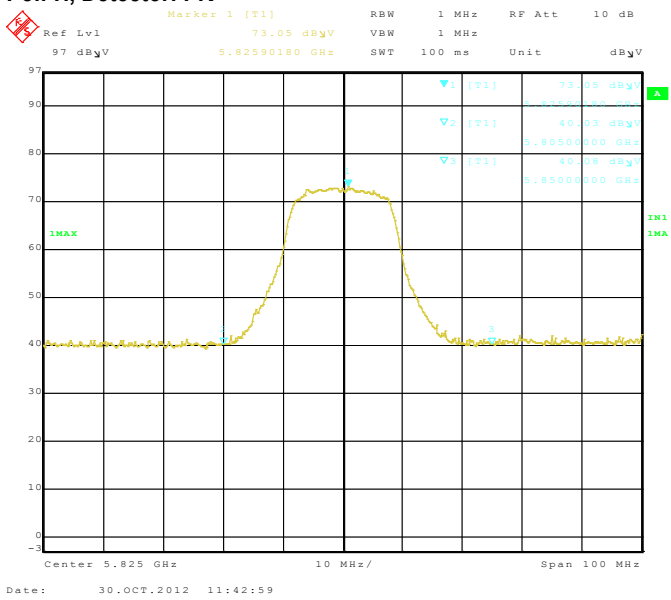
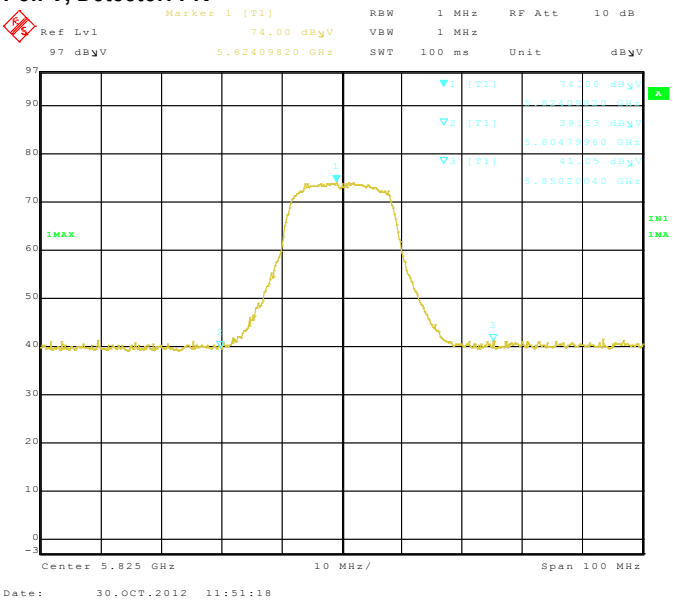


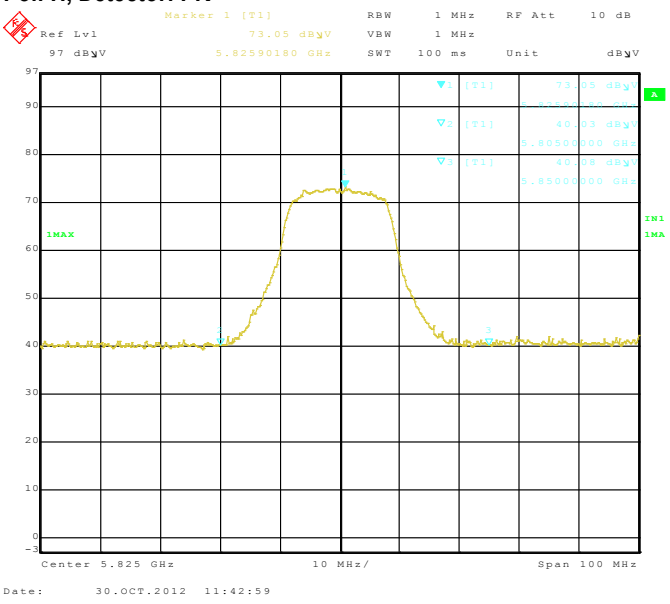
Figure 3-23: Band-Edge Compliance of RF Radiated Emission.

Figure 3-24: Band-Edge Compliance of RF Radiated Emission.

802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz
Pol: V, Detector: PK



802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz
Pol: H, Detector: PK



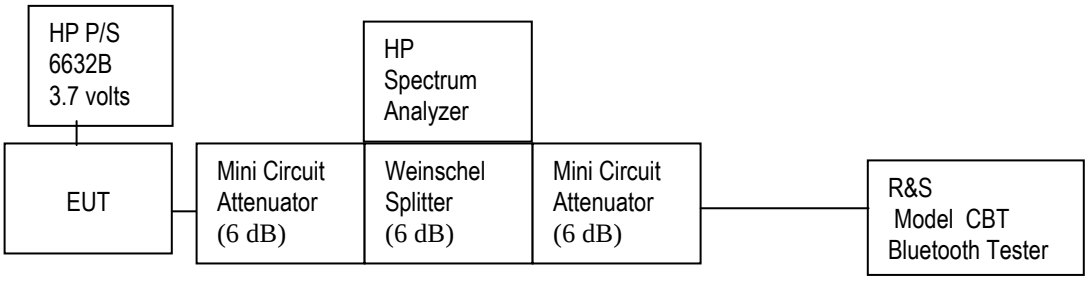
APPENDIX 4 – BLUETOOTH AND BLUETOOTH LOW ENERGY CONDUCTED EMISSIONS TEST DATA/PLOTS

Bluetooth RF Conducted Emission Test Results

Bluetooth power output from BlackBerry® smartphone was at maximum for all the recorded measurements shown below.
The measurements were performed by Kevin Guo.

Date of test: June 26, 2012

Test Setup Diagram



A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

The environmental test conditions were: Temperature: 22 ºC
Relative Humidity: 44 %

Bluetooth RF Conducted Emission Test Results cont'd

20 dB Bandwidth

The EUT met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode.

Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.0	0.918
39	≤1.0	0.923
78	≤1.0	0.923

See figures 4-1 to 4-3 for the plots of the 20 dB bandwidth measurements.

Figure 4-1: 20 dB Bandwidth
Single freq., Static PBRS, DH5

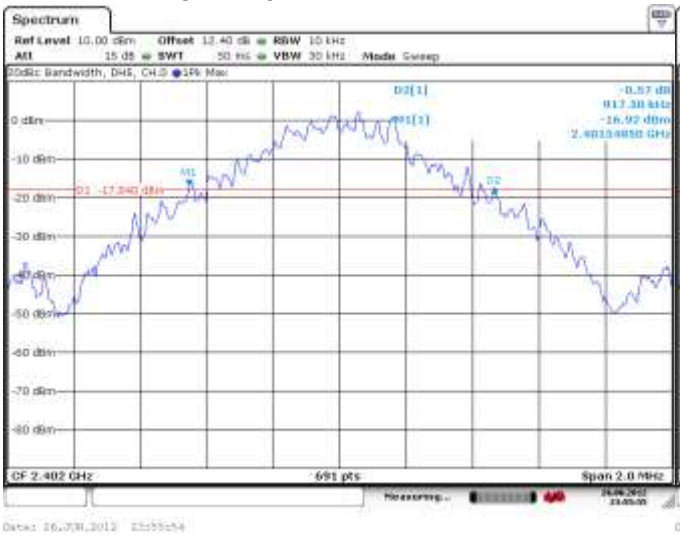
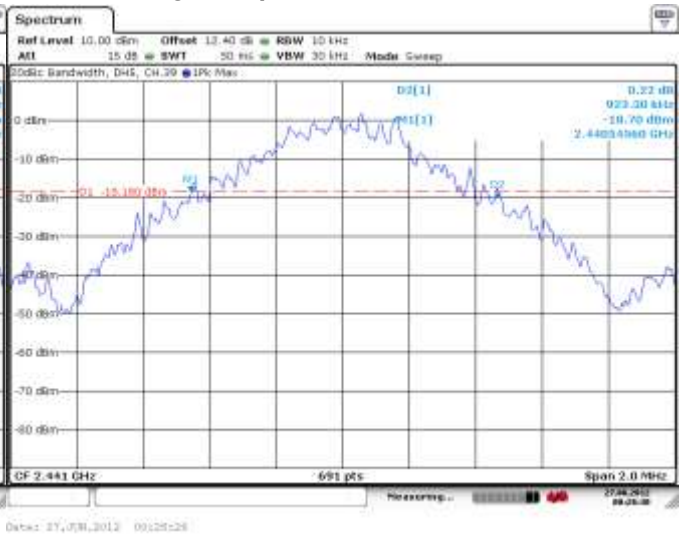
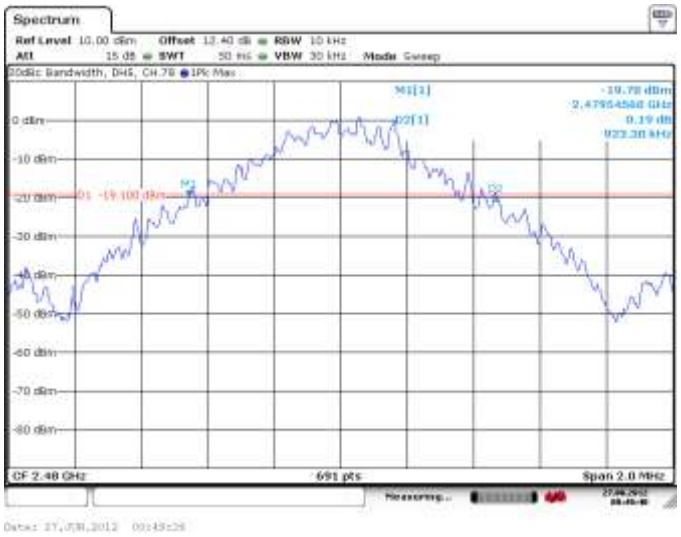


Figure 4-2: 20 dB Bandwidth
Single freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-3: 20 dB Bandwidth
Single freq., Static PBRS, DH5



Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	1.259
39	≤1.5	1.316
78	≤1.5	1.319

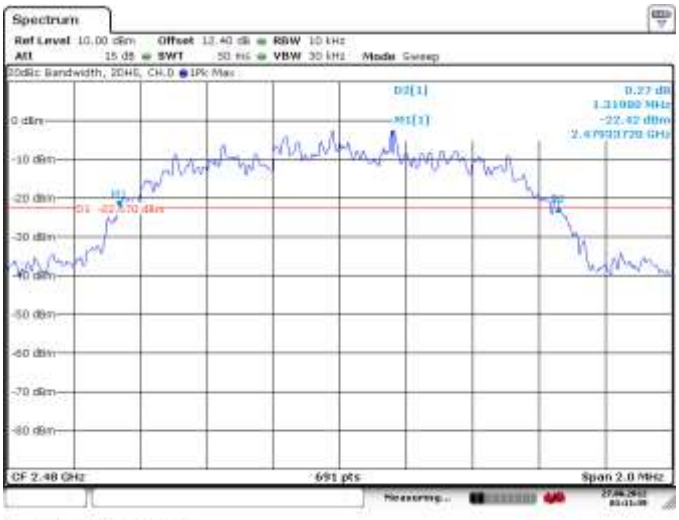
See figures 4-4 to 4-6 for the plots of the 20 dB bandwidth measurements.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-4: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5

Figure 4-5: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5

Figure 4-6: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5



Using Pattern type “Static PBRS” and packet type “3-DH5” during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	1.314
39	≤1.5	1.311
78	≤1.5	1.314

See figures 4-7 to 4-9 for the plots of the 20 dB bandwidth measurements.

Figure 4-7: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

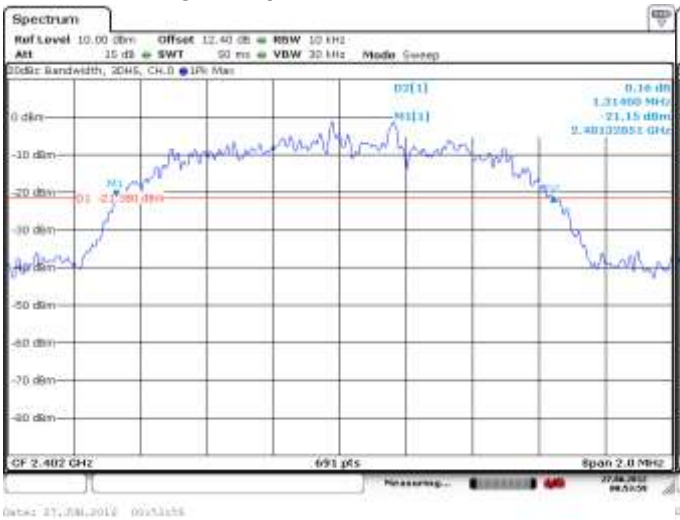


Figure 4-8: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

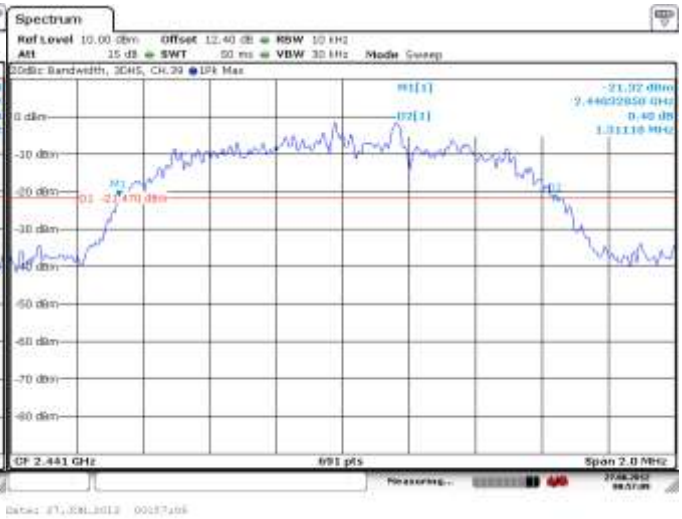


Figure 4-9: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5


Spectrum
Ref Level 10.00 dBm Offset 12.40 dB RBW 10 kHz
Att 15 dB SWT 50 ms VBW 30 kHz Mode Sweep
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
691 pts
Span 2.0 MHz

Bluetooth RF Conducted Emission Test Results cont'd

Carrier Frequency Separation

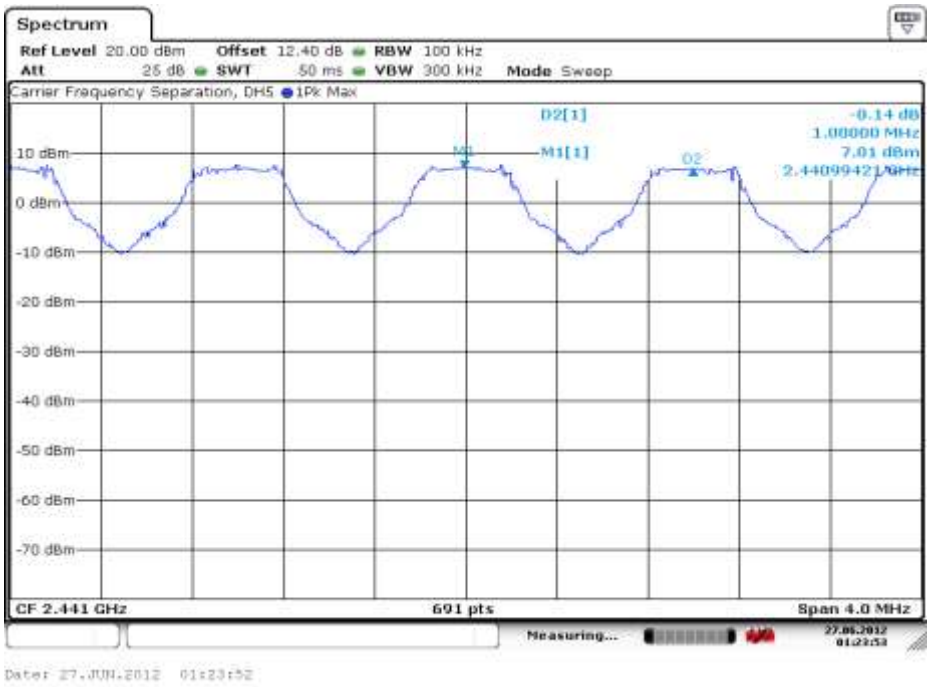
The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode.

Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	≥ 0.025 or 20 dB bandwidth	1.000

See figure 4-10 for the plot of the Carrier Frequency Separation measurement.

Figure 4-10: Carrier Frequency Separation, Freq. Hopping, Static PBRS, DH5, Channels 38 to 39



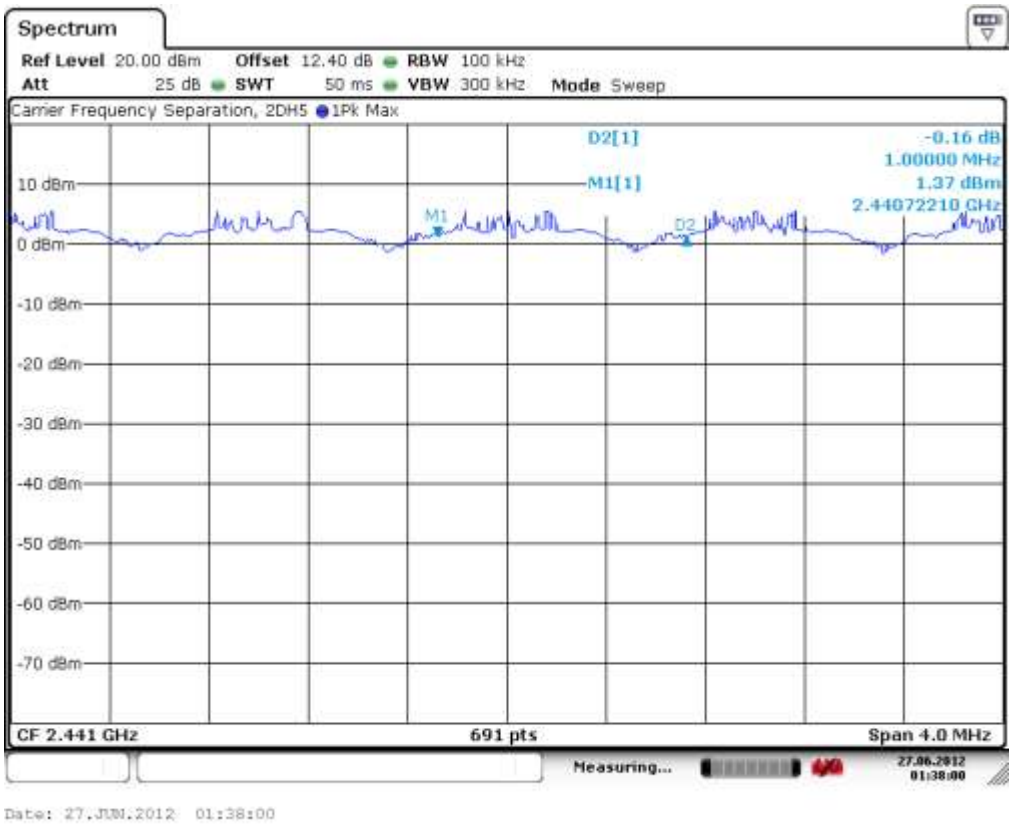
Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	≥ 0.025 or 20 dB bandwidth	1.000

See figure 4-11 for the plot of the Carrier Frequency Separation measurement.

Figure 4-11: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 2-DH5, Channels 38 to 39



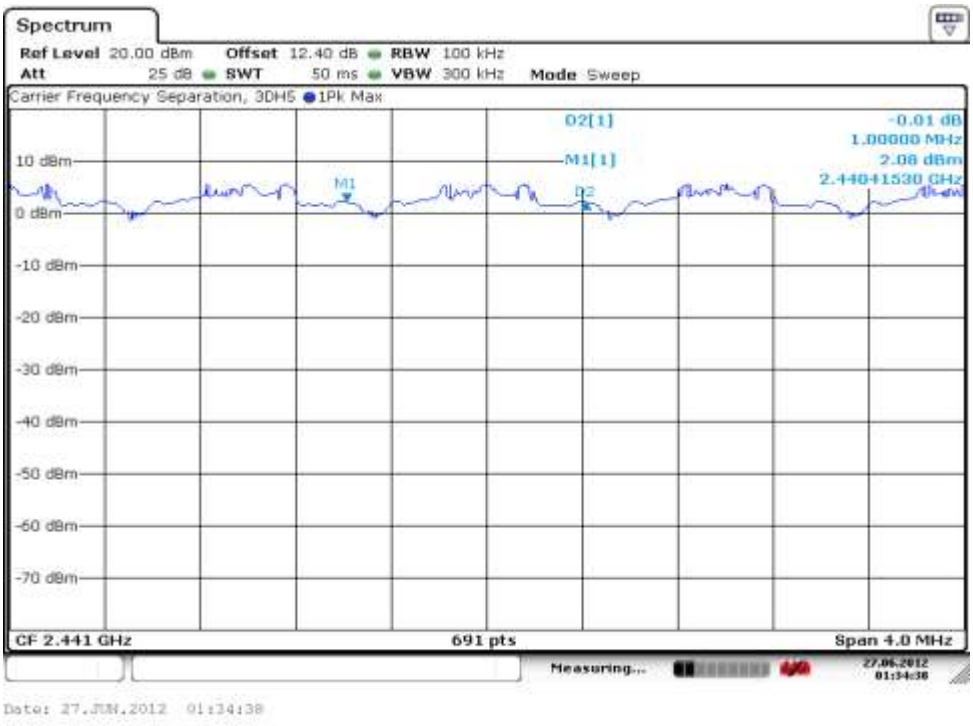
Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PBRS" and packet type "3-DH5" during the measurements.

Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	≥ 0.025 or 20 dB bandwidth	1.000

See figure 4-12 for the plot of the Carrier Frequency Separation measurement.

Figure 4-12: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 3-DH5, Channels 38 to 39



Bluetooth RF Conducted Emission Test Results cont'd

Number of Hopping Frequencies

The EUT met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. Bluetooth was operating in frequency hopping (Euro/US) mode.

Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Limit (CH)	Number of Hopping Frequencies (CH)
≥75	79

See figures 4-13 to 4-16 for the plots of the number of hopping frequencies.

Figure 4-13: Number of Hopping Frequencies Static PBRS, DH5

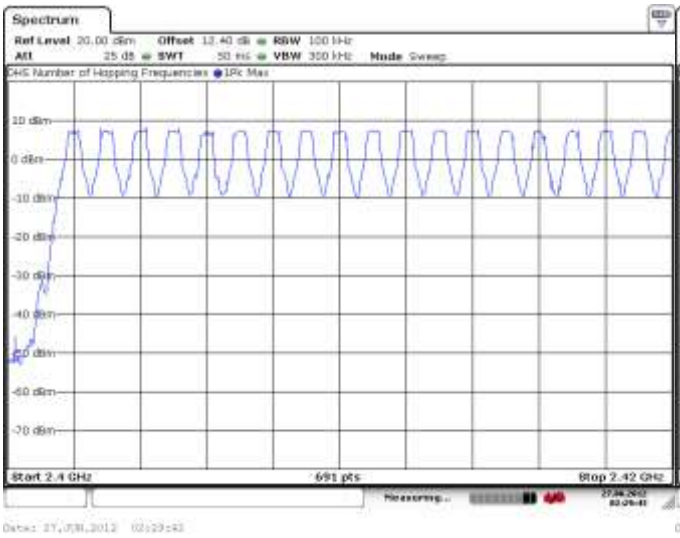
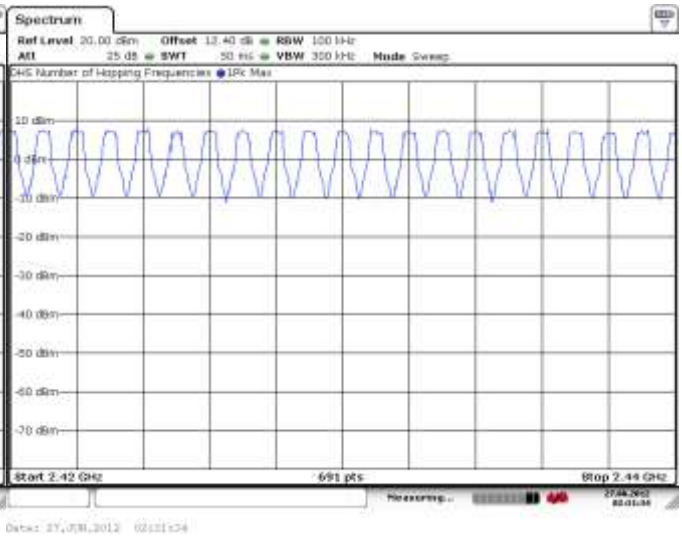


Figure 4-14: Number of Hopping Frequencies Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-15: Number of Hopping Frequencies Static PBRS, DH5

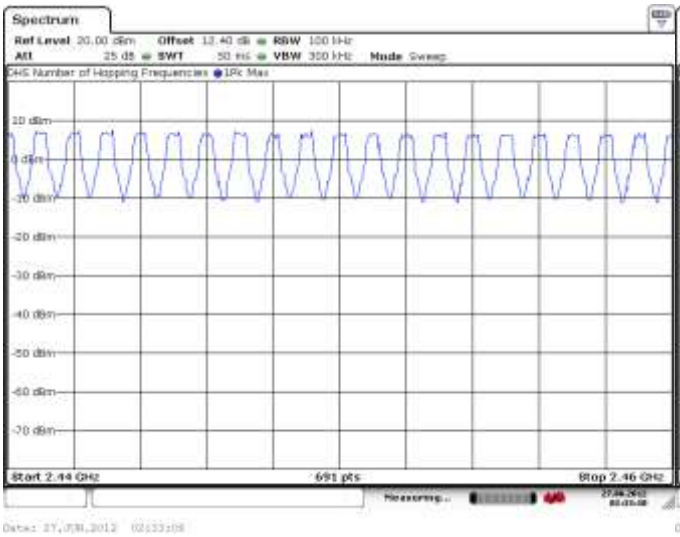
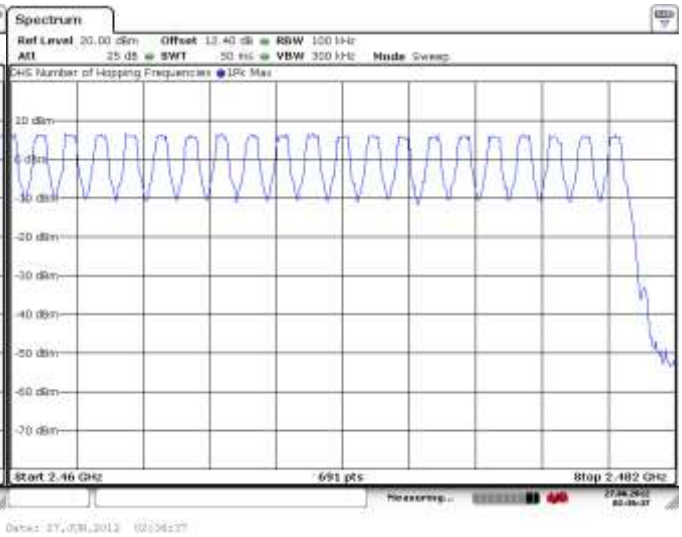


Figure 4-16: Number of Hopping Frequencies Static PBRS, DH5



Time of Occupancy (Dwell Time)

The EUT met the requirements of the time of occupancy (dwell time) as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in packet types DH1, DH3 and DH5. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements. The frequency hopping is 1600 hops per second for a dwell time of 625 µsec for 79 channels.

A DH1 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 800 hops per second with 79 channels which is 10.127 times per second. As per 15.247(a) (iii) "The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed". Therefore for 31.6 seconds (79x0.4) there are 320.0 times of appearance.

A DH3 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 400 hops per second with 79 channels which is 5.06 times per second. Therefore for 31.6 seconds there are 159.9 times of appearance.

A DH5 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 266.7 hops per second with 79 channels which is 3.38 times per second. Therefore for 31.6 seconds there are 106.8 times of appearance.

Bluetooth RF Conducted Emission Test Results cont'd

Bluetooth Channel	Mode	Tx Time (ms)	Dwell Time/31.6 sec. (msec.)	Limit (msec.)	Margin (msec.)
0	DH1	0.4130	0.4130 x 320.0 = 132.16	400	267.84
39	DH1	0.4070	0.4070 x 320.0 = 130.24	400	269.76
78	DH1	0.4110	0.4110 x 320.0 = 131.52	400	268.48
0	DH3	1.6700	1.6700 x 159.9 = 267.03	400	132.97
39	DH3	1.6700	1.6700 x 159.9 = 267.03	400	132.97
78	DH3	1.6780	1.6780 x 159.9 = 268.31	400	131.69
0	DH5	2.9220	2.9220 x 106.8 = 312.07	400	87.93
39	DH5	2.9220	2.9220 x 106.8 = 312.07	400	87.93
78	DH5	2.9220	2.9220 x 106.8 = 312.07	400	87.93

See figures 4-17 to 4-25 for the plots of the dwell time.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-17: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

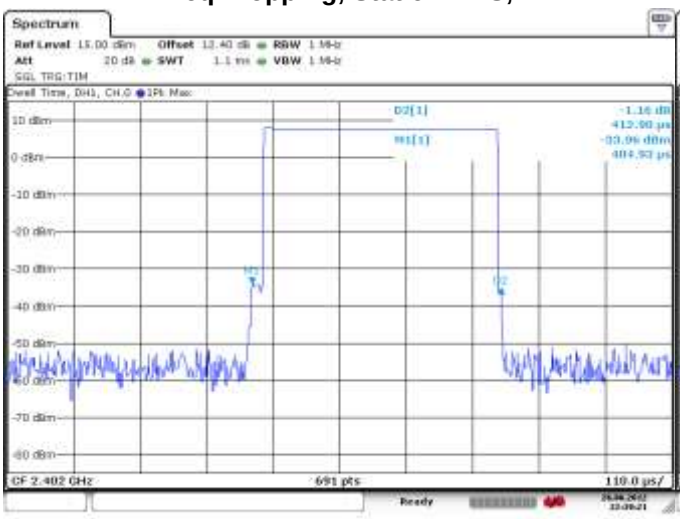
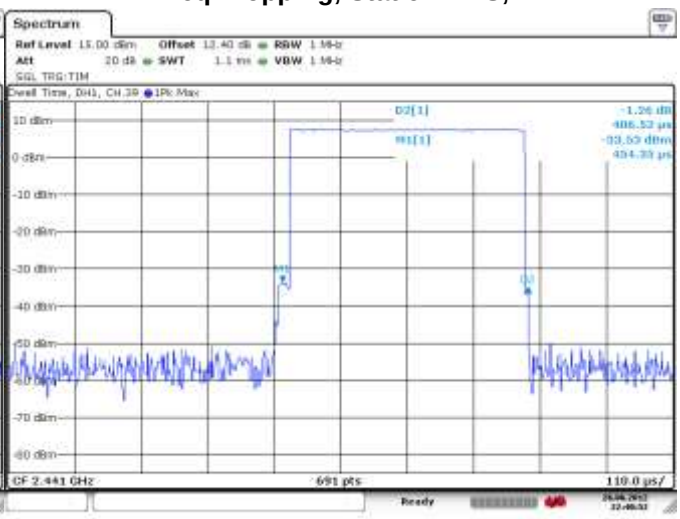


Figure 4-18: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-19: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

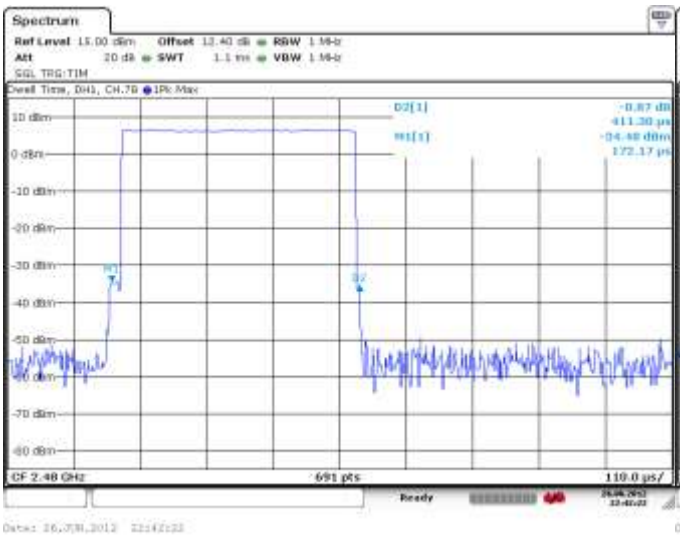


Figure 4-20: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

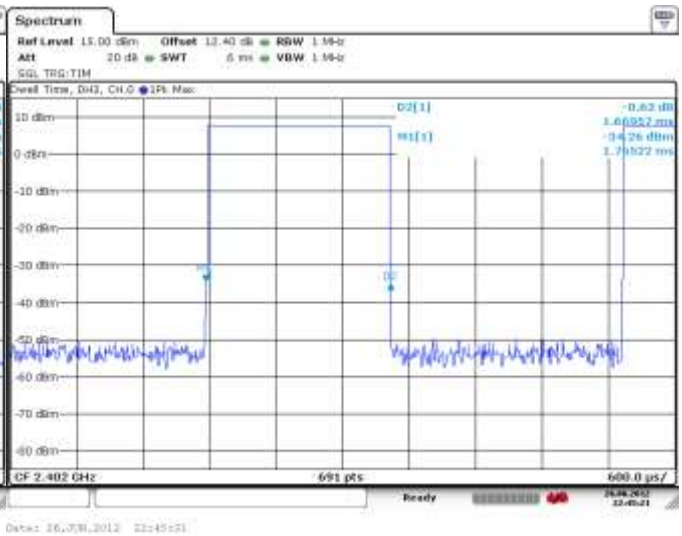


Figure 4-21: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

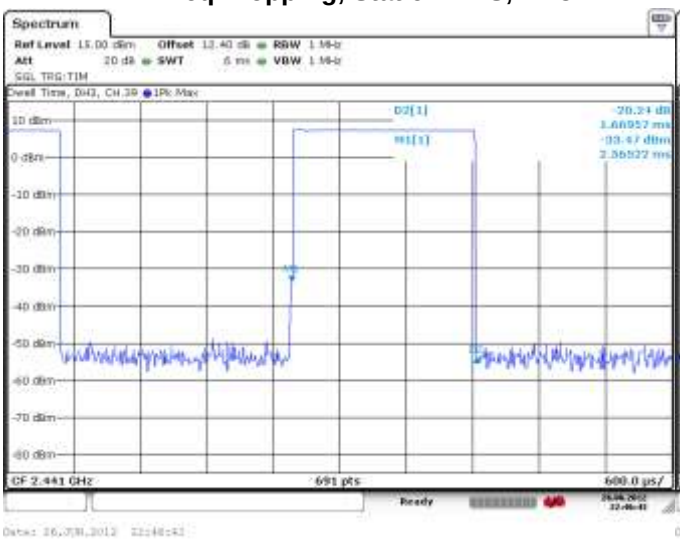
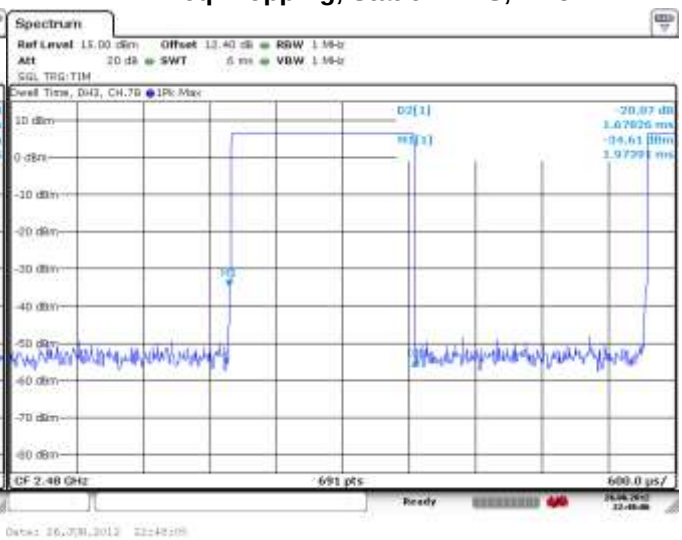


Figure 4-22: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-23: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5

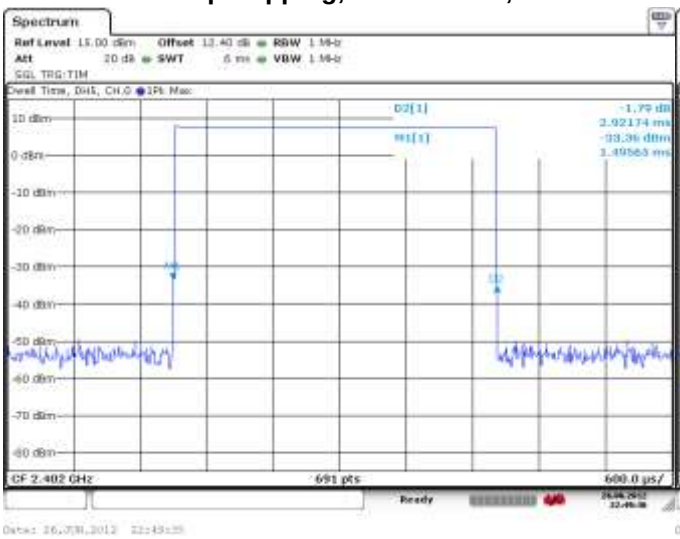


Figure 4-24: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5

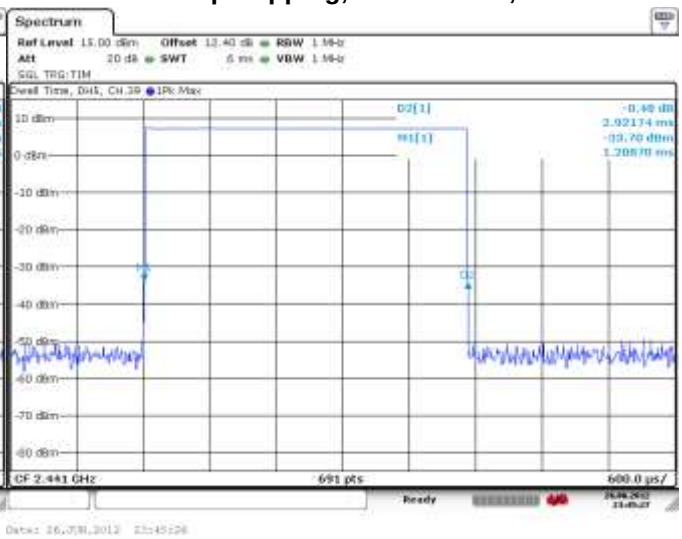
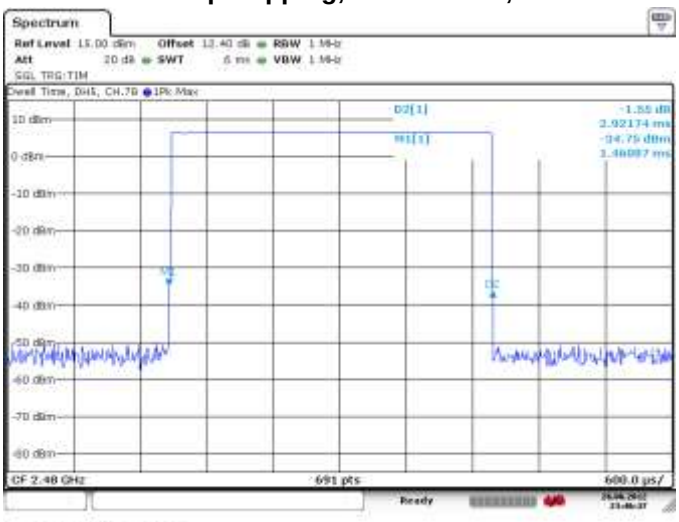


Figure 4-25: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Maximum Peak Conducted Output Power

The EUT met the requirements of the maximum peak conducted output power of class 1 as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the coaxial cable loss and attenuators in the test circuit.

Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	8.11	0.00647	0.0 to 20.0
39	7.68	0.00586	0.0 to 20.0
78	6.60	0.00457	0.0 to 20.0

See figures 4-26 to 4-28 for the plots of the maximum peak conducted output power.

Figure 4-26: Max. Peak Conducted Output Power Single Freq., Static PBRS, DH5

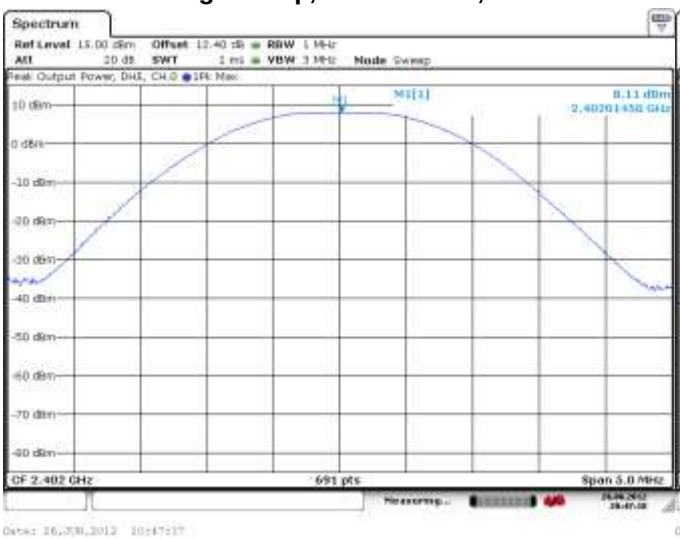
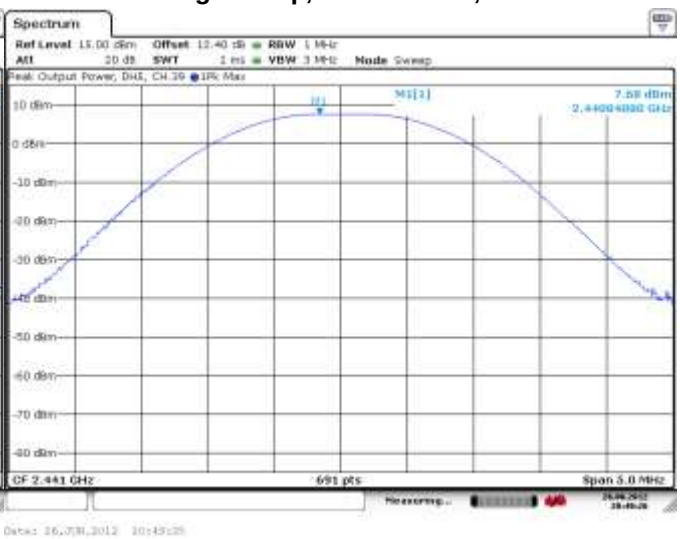
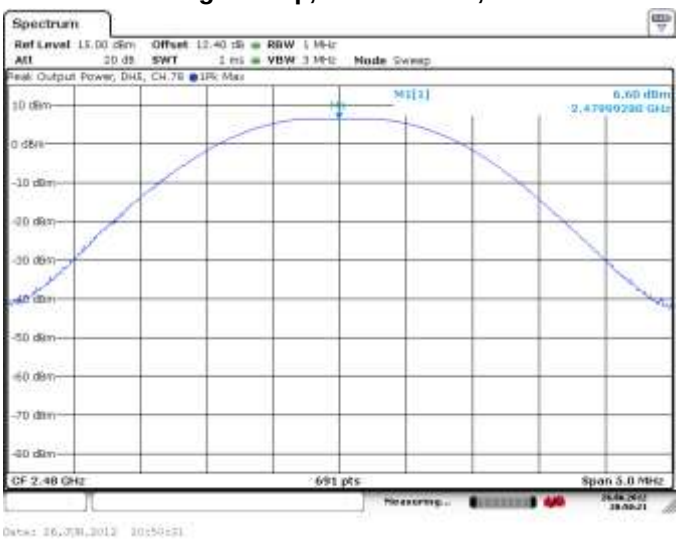


Figure 4-27: Max. Peak Conducted Output Power Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-28: Max. Peak Conducted Output Power
Single Freq., Static PBRS, DH5



Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	6.90	0.00490	0.0 to 20.0
39	6.60	0.00457	0.0 to 20.0
78	5.51	0.00356	0.0 to 20.0

See figures 4-29 to 4-31 for the plots of the maximum peak conducted output power.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-29: Max. Peak Conducted Output Power
Single Freq., Static PBRS, 2-DH5

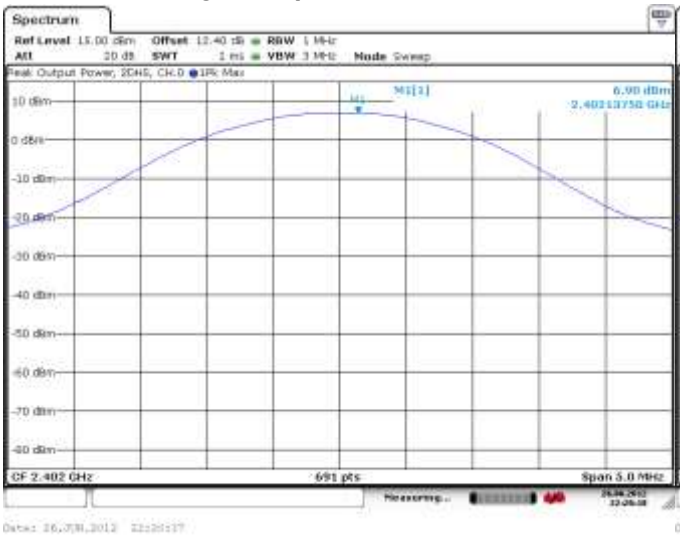


Figure 4-30: Max. Peak Conducted Output Power
Single Freq., Static PBRS, 2-DH5

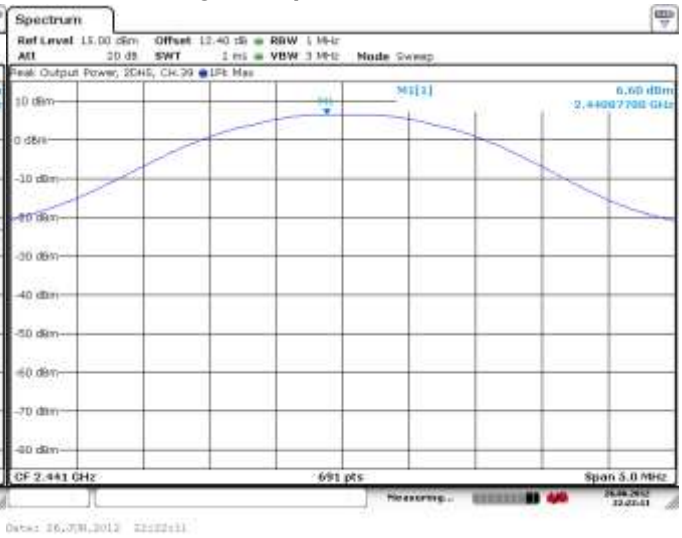
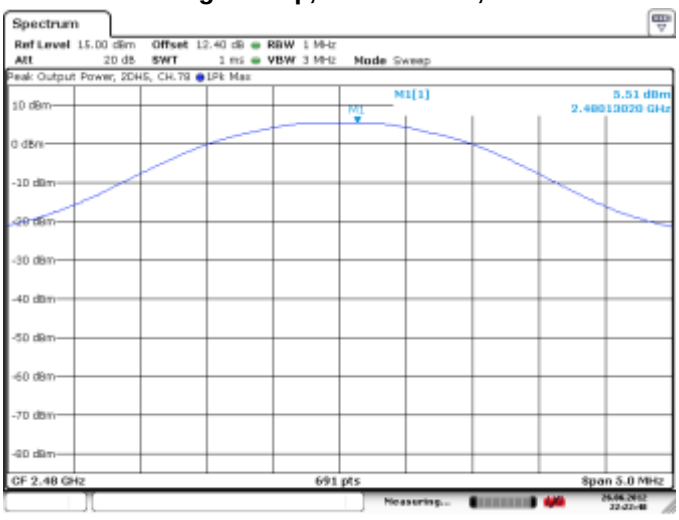


Figure 4-31: Max. Peak Conducted Output Power
Single Freq., Static PBRS, 2-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PBRS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	7.52	0.00565	0.0 to 20.0
39	7.16	0.00520	0.0 to 20.0
78	6.10	0.00407	0.0 to 20.0

See figures 4-32 to 4-34 for the plots of the maximum peak conducted output power.

Figure 4-32: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5

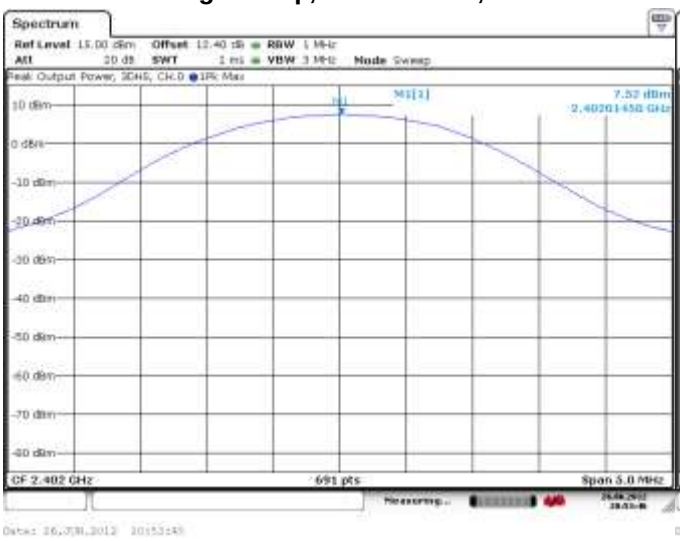
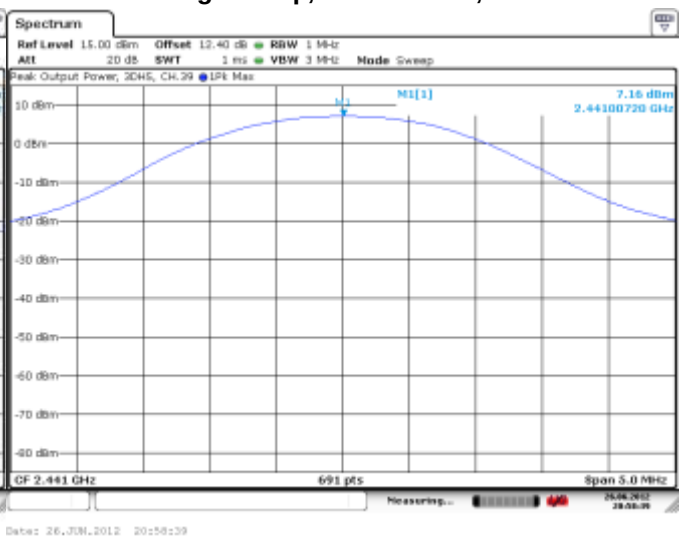
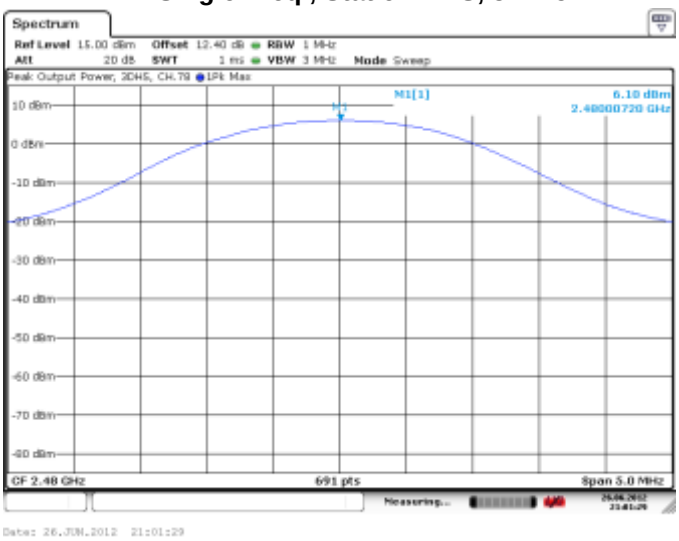


Figure 4-33: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-34: Max. Peak Conducted Output Power
Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Low channel (0) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode.

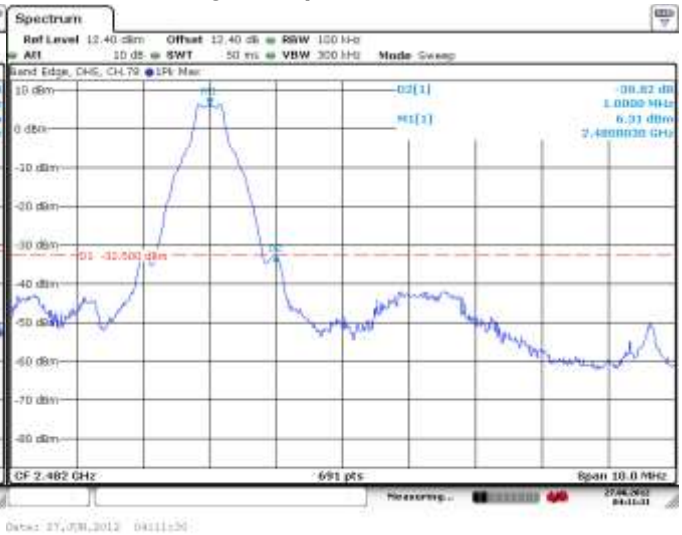
Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-38.86	-20	-18.86
78	Single Frequency	-38.82	-20	-18.82
0	Hopping	-40.36	-20	-20.36
78	Hopping	-40.12	-20	-20.12

See figures 4-35 to 4-38 for the plots of the band edge compliance measurements.

Figure 4-35: Band Edge Compliance
Single Freq., Static PBRS, DH5

Figure 4-36: Band Edge Compliance
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-37: Band Edge Compliance Freq. Hopping, Static PBRS, DH5

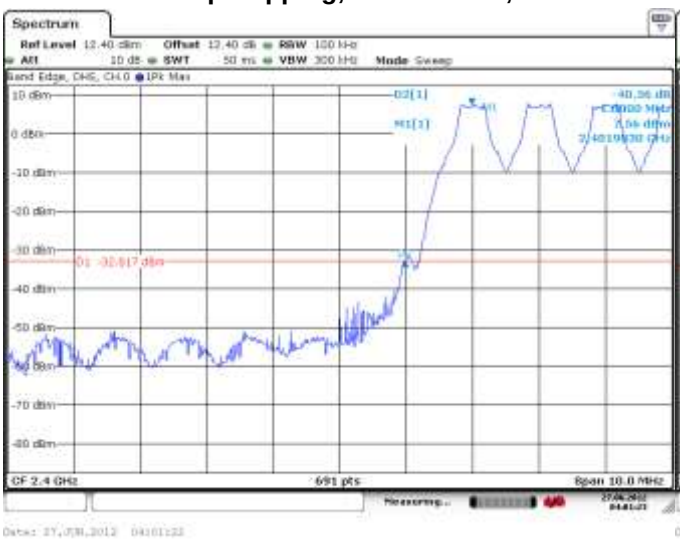
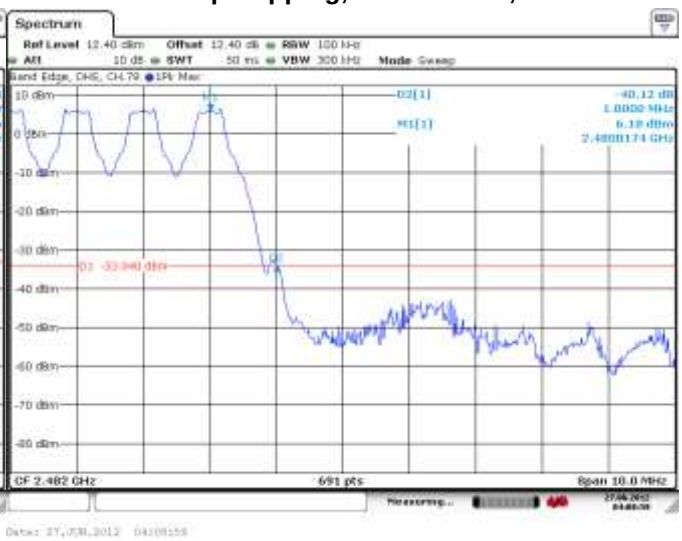


Figure 4-38: Band Edge Compliance Freq. Hopping, Static PBRS, DH5



Using pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-33.58	-20	-13.58
78	Single Frequency	-28.71	-20	-8.71
0	Hopping	-33.65	-20	-13.65
78	Hopping	-29.38	-20	-9.38

See figures 4-39 to 4-42 for the plots of the band edge compliance measurements.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-39: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

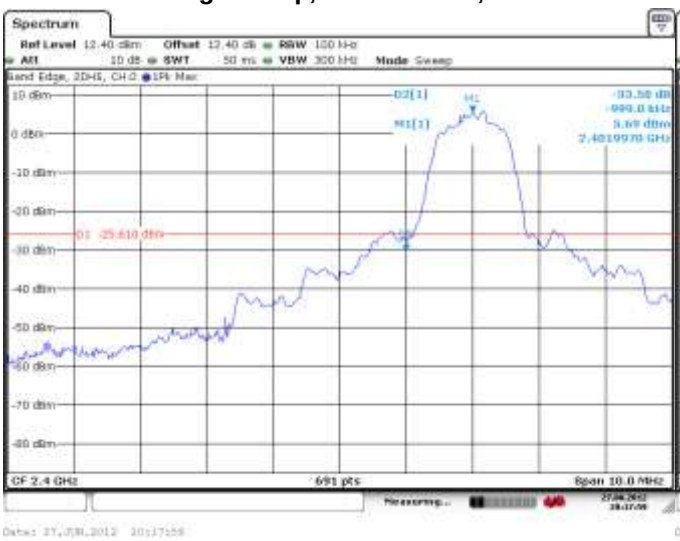


Figure 4-40: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

Figure 4-41: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5

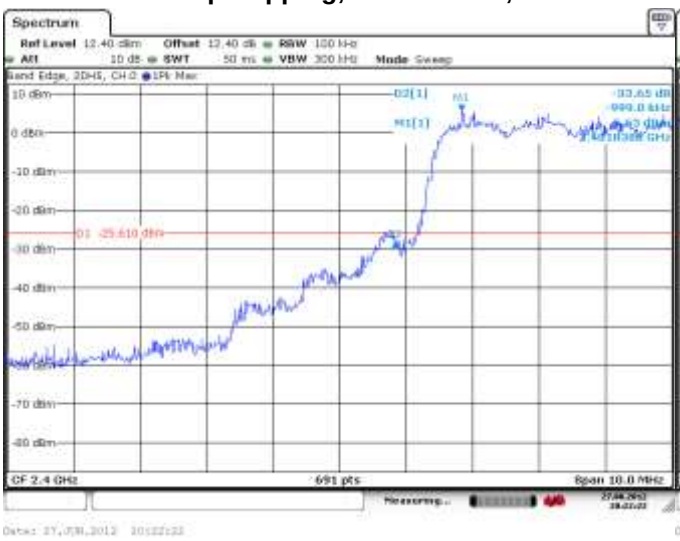
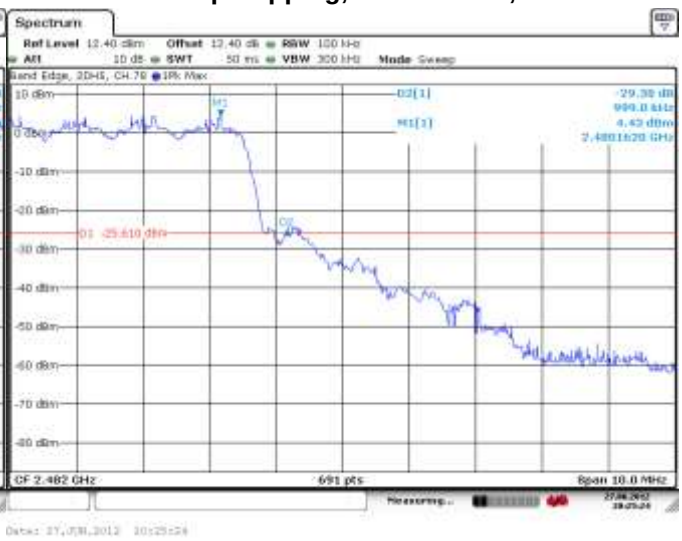


Figure 4-42: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5



Bluetooth RF Conducted Emission Test Results cont'd

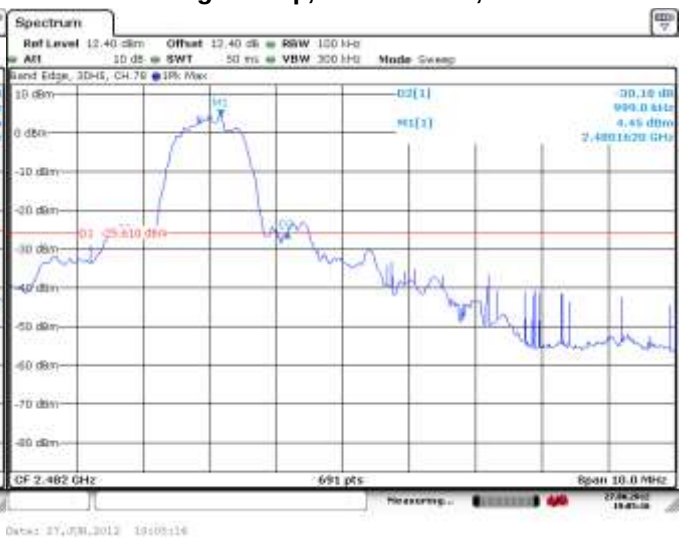
Using pattern type "Static PBRS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-30.82	-20	-10.82
78	Single Frequency	-30.18	-20	-10.18
0	Hopping	-30.84	-20	-10.84
78	Hopping	-30.05	-20	-10.05

See figures 4-43 to 4-46 for the plots of the band edge compliance measurements.

Figure 4-43: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

Figure 4-44: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-45: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

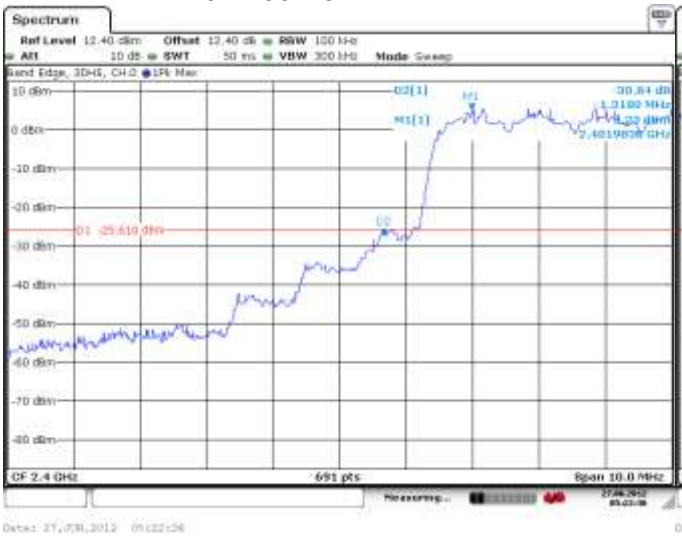


Figure 4-46: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

Bluetooth RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Low channel (0), mid channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0	8.11	-40.00	-48.11	-20
39	7.68	-32.83	-40.51	-20
78	6.60	-32.50	-39.10	-20
Hopping mode	6.60	-38.83	-45.43	-20

See figures 4-47 to 4-50 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-47: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5,

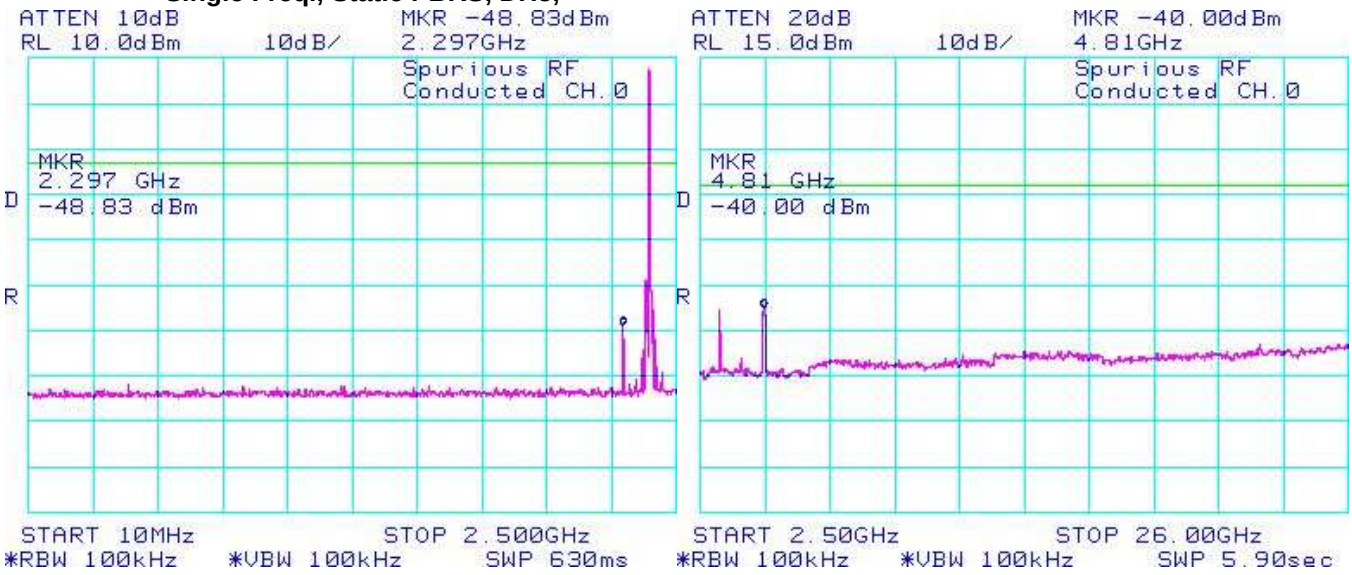
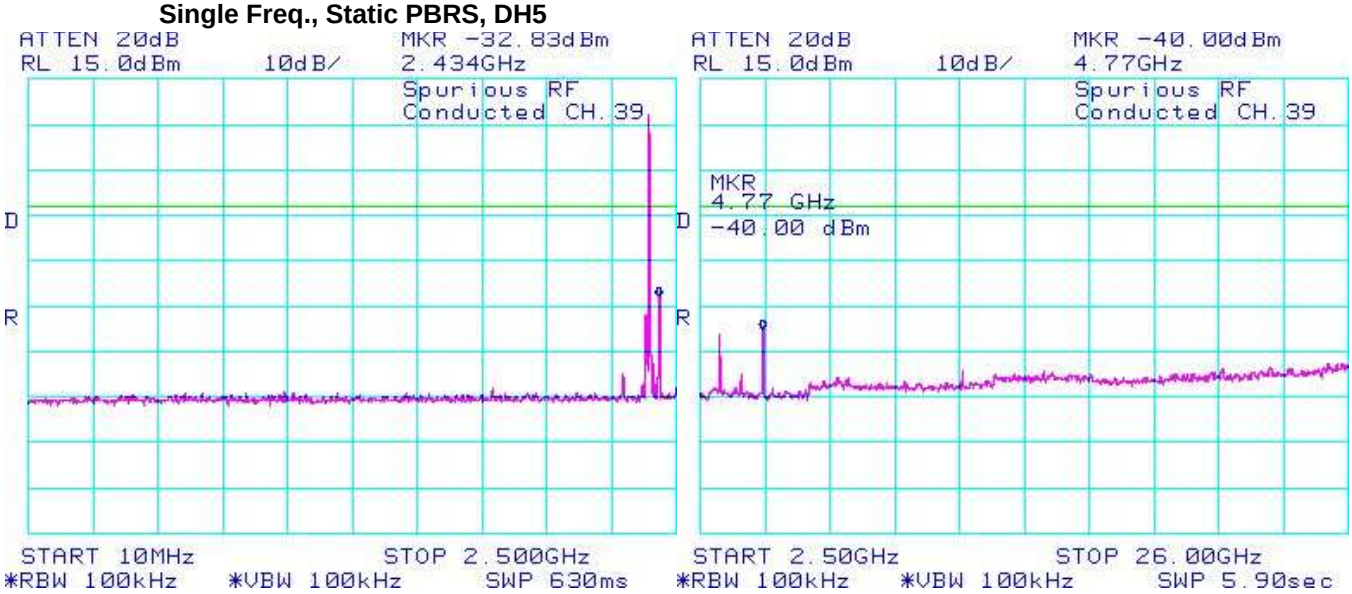


Figure 4-48: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-49: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5

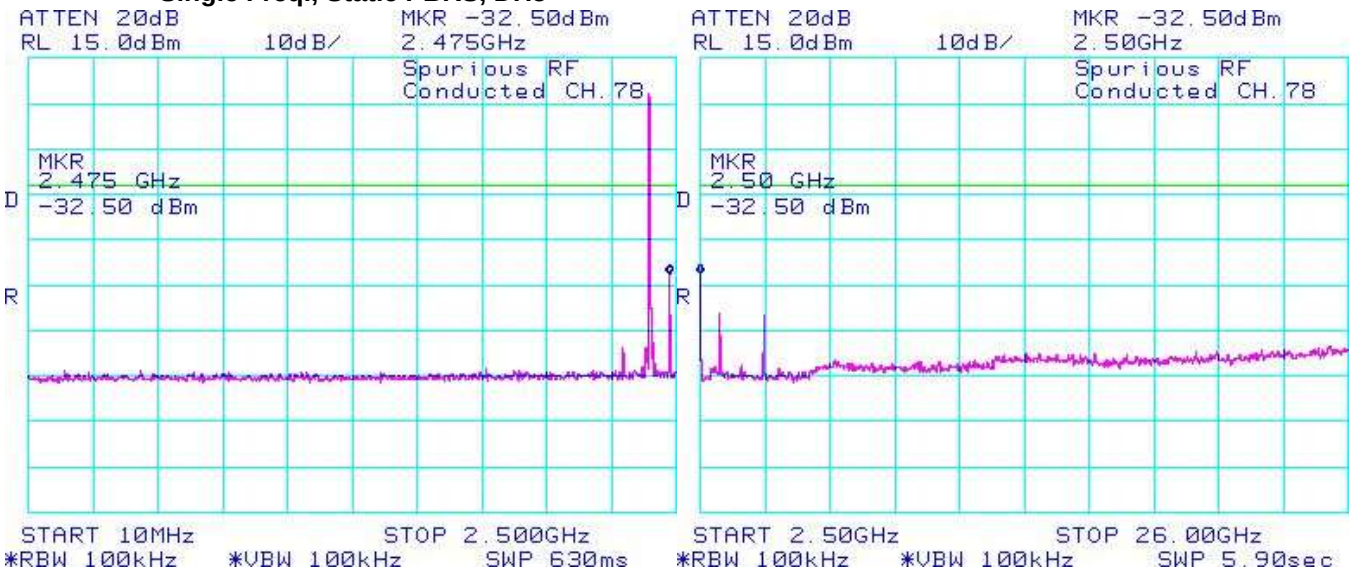
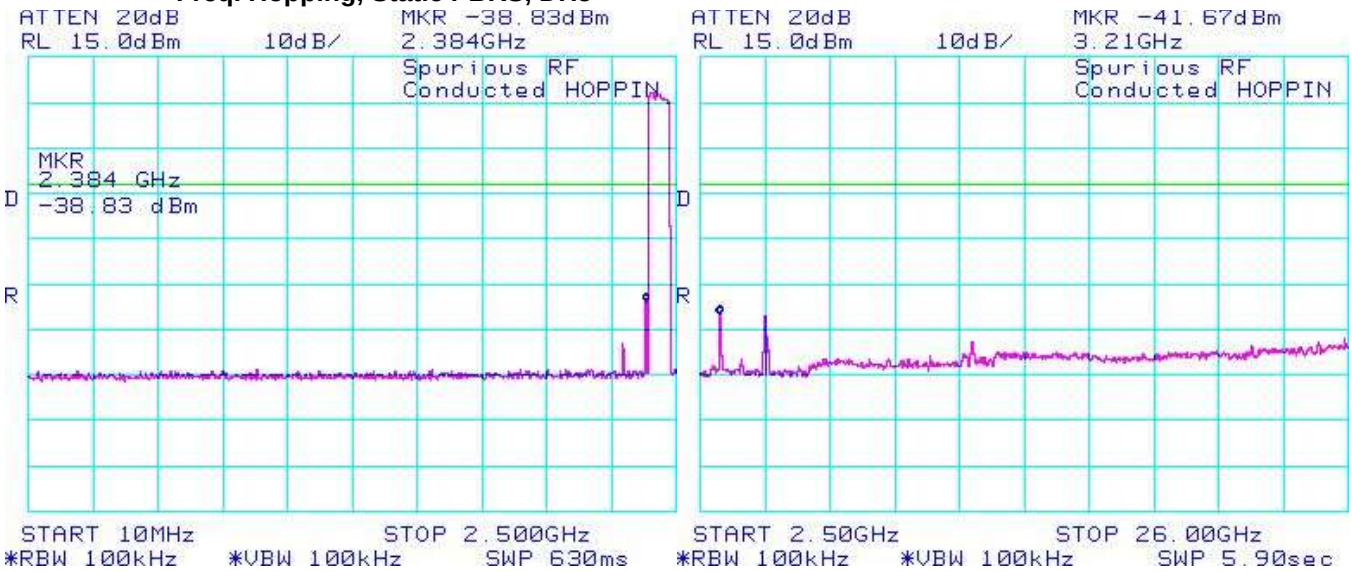


Figure 4-50: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Using pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0	6.90	-38.50	-45.40	-20
39	6.60	-33.17	-26.57	-20
78	5.51	-32.83	-38.34	-20
Hopping mode	5.51	-42.17	-47.68	-20

See figures 4-51 to 4-54 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-51: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

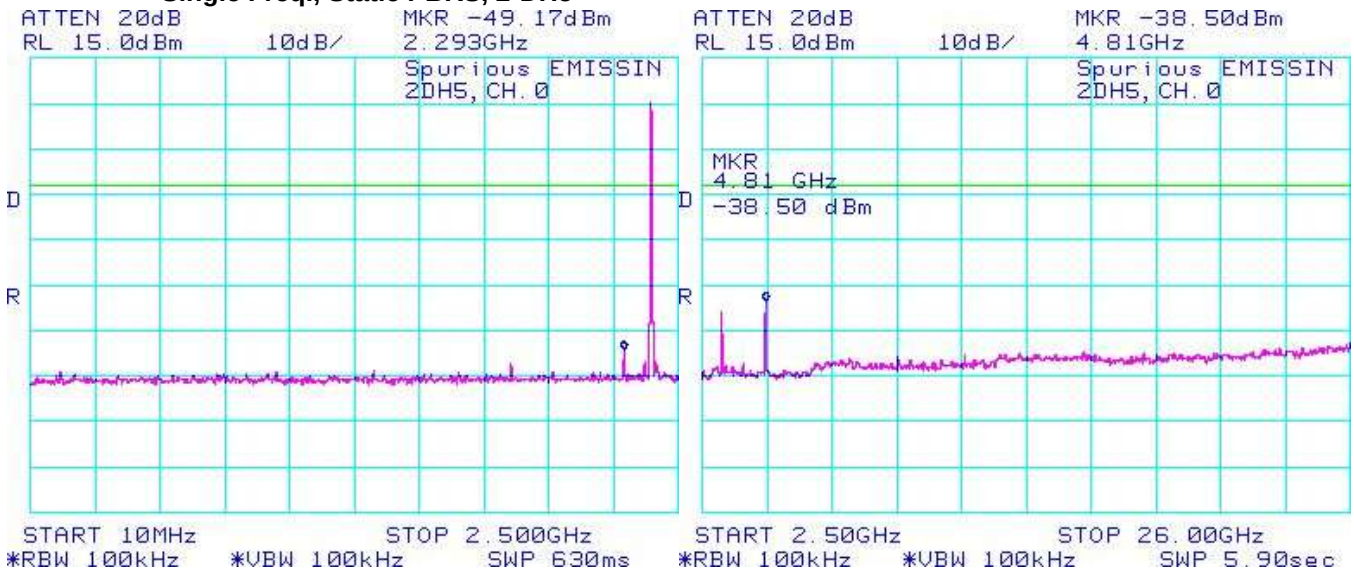
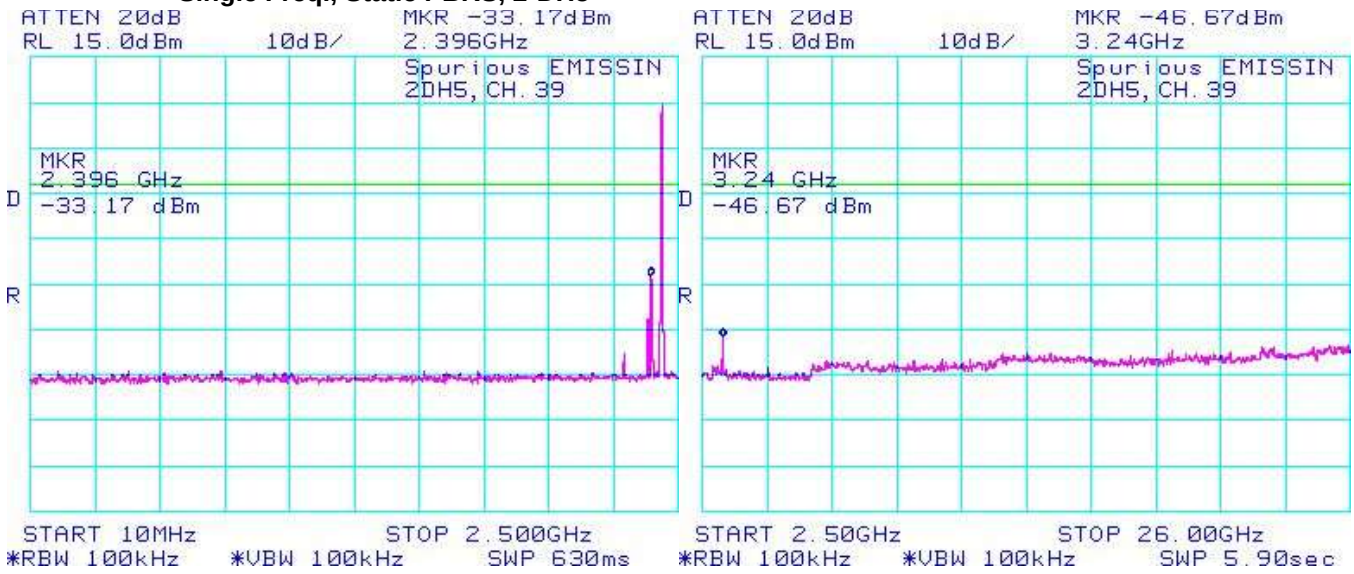


Figure 4-52: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-53: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

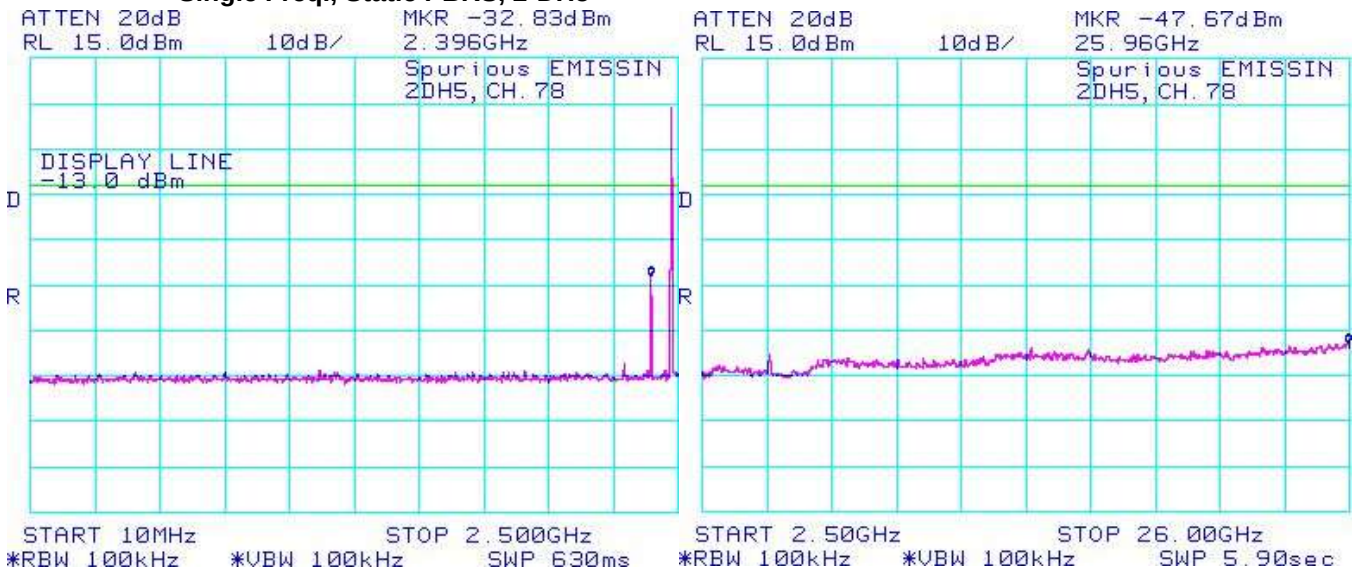
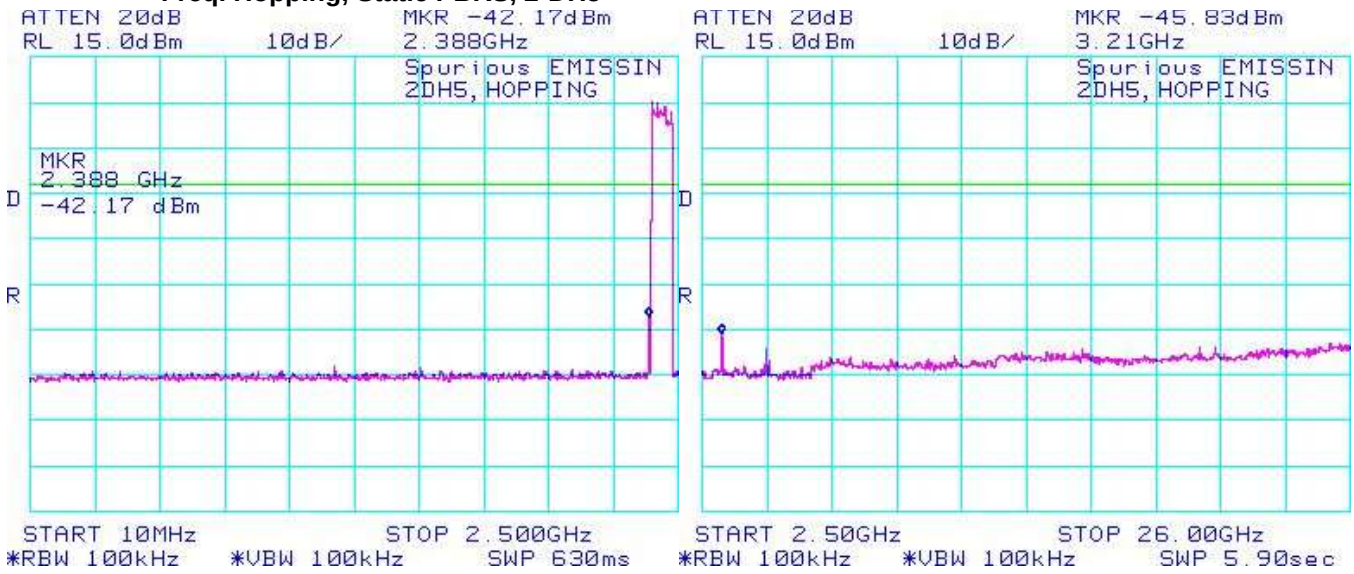


Figure 4-54: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 2-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Using pattern type "Static PBRS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0	7.52	-44.50	-52.02	-20
39	7.16	-32.83	-39.99	-20
78	6.10	-33.67	-39.77	-20
Hopping mode	6.10	-38.50	-44.60	-20

See figures 4-55 to 4-58 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-55: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

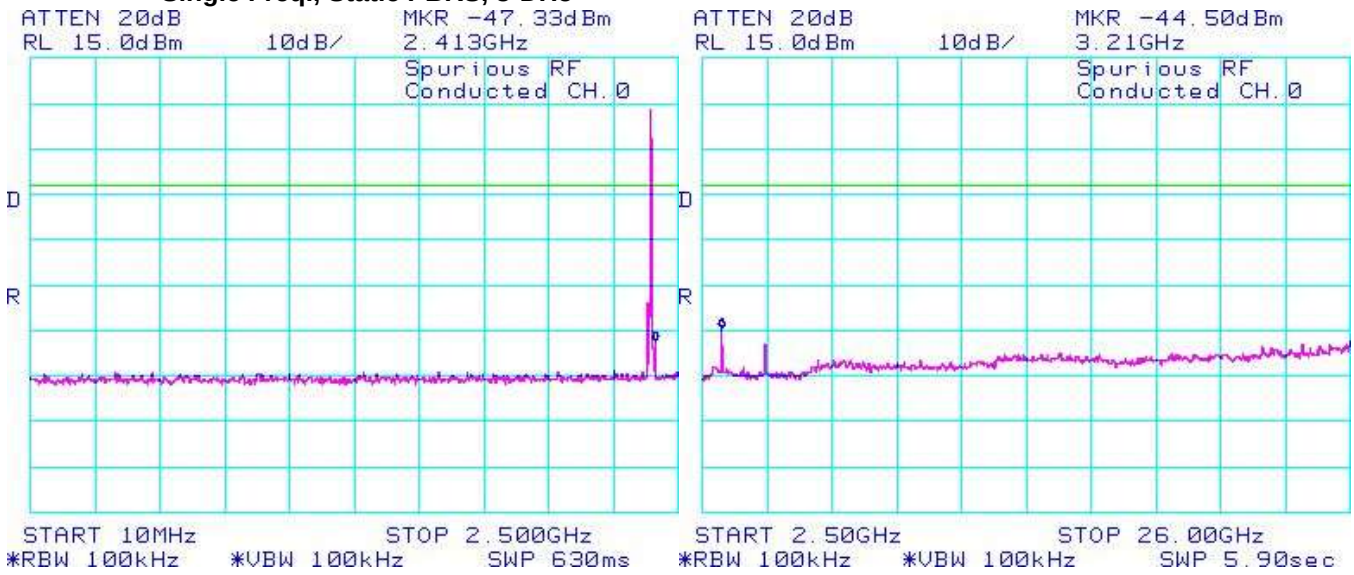
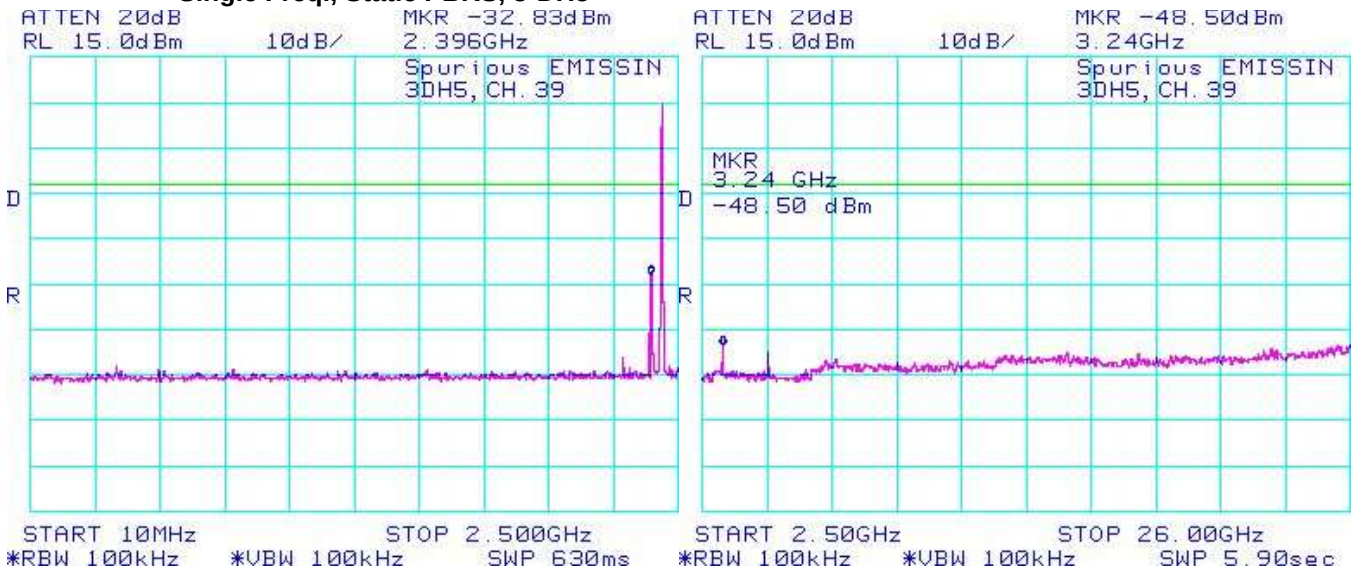


Figure 4-56: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-57: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

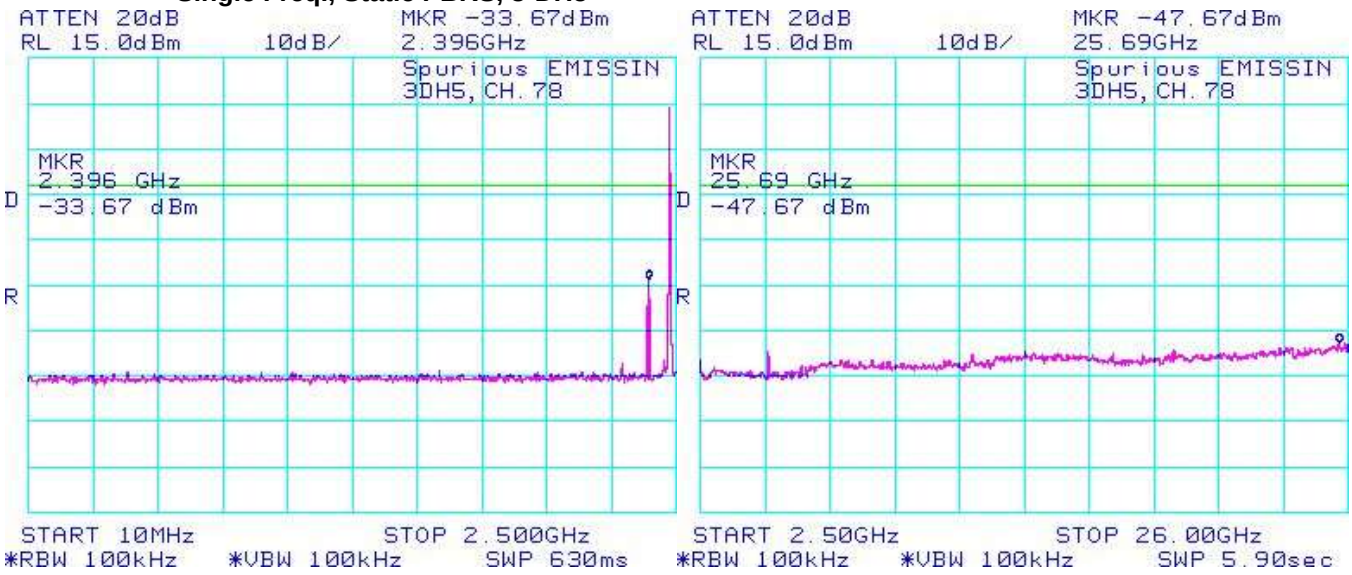
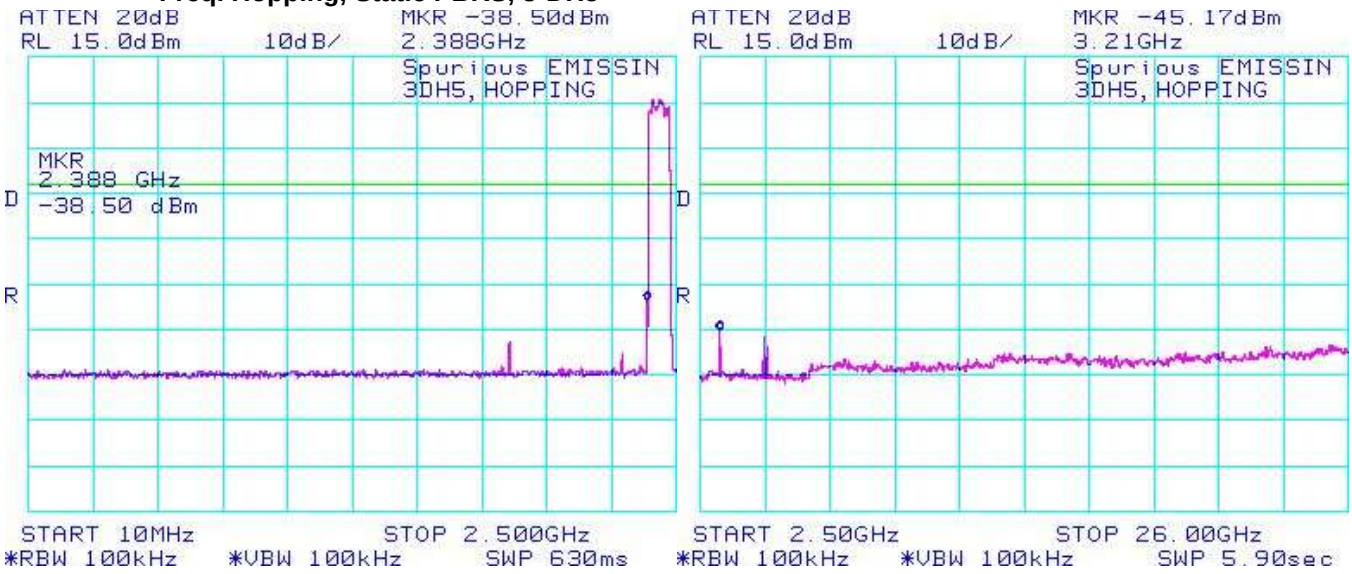


Figure 4-58: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 3-DH5



Bluetooth Low Energy RF Conducted Emission Test Results

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210. Channels 0, 20 and 39 were measured.

Channel	Limit (kHz)	Measured Level (MHz)
0	≥ 500	0.673
20	≥ 500	0.665
39	≥ 500	0.670

See figures 4-59 to 4-61 for the plots of the 6 dB bandwidth measurements for Channels 0, 20, and 39.

Figure 4-59: 6 dB Bandwidth
LE, Channel 0

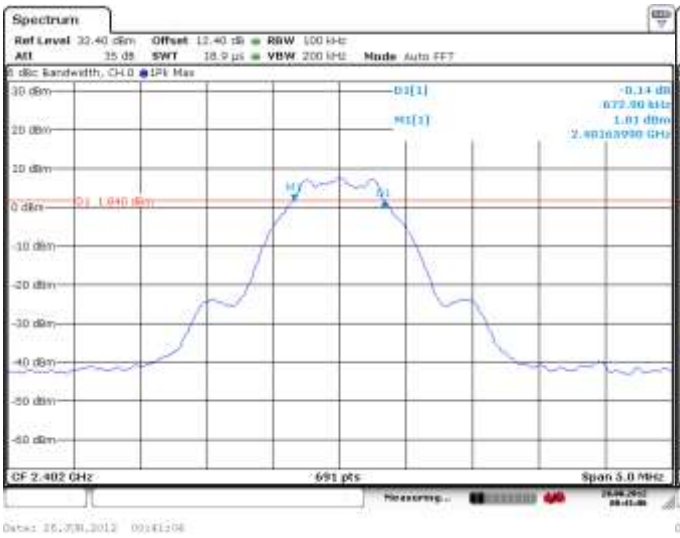
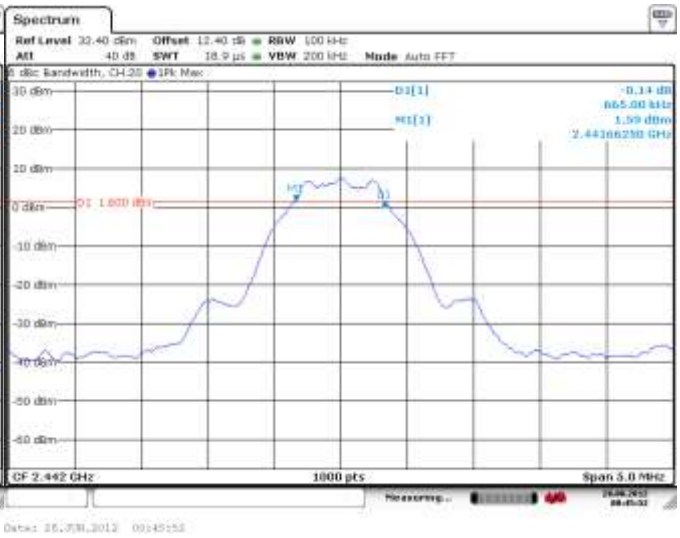
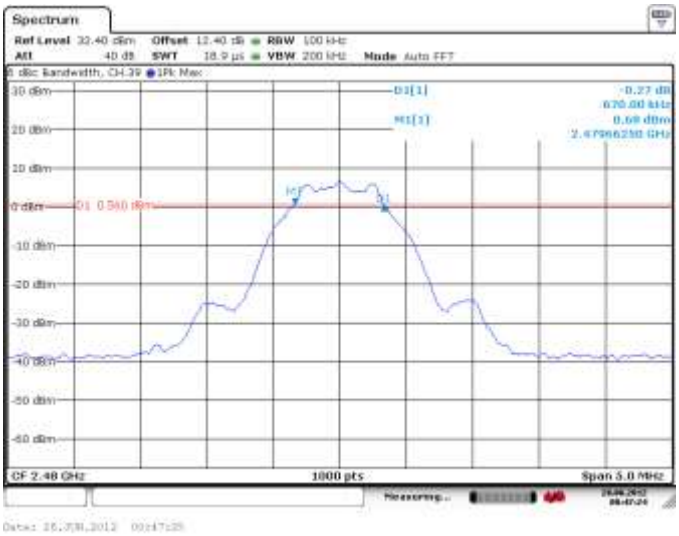


Figure 4-60: 6 dB Bandwidth
LE, Channel 20



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 4-61: 6 dB Bandwidth
LE, Channel 39



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.247(b)(3) and RSS-210. Channels 0, 20 and 39 were measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
0	< 1.00	7.75	0.00596
20	< 1.00	7.30	0.00537
39	< 1.00	6.28	0.00425

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 39 were measured.

Channel	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
0	< -20	-41.13	-21.13
39	< -20	-43.32	-23.32

See figures 4-62 to 4-63 for the plots of the band edge compliance measurements for Channels 0 and 39.

Figure 4-62: Band Edge Compliance LE, Channel 0

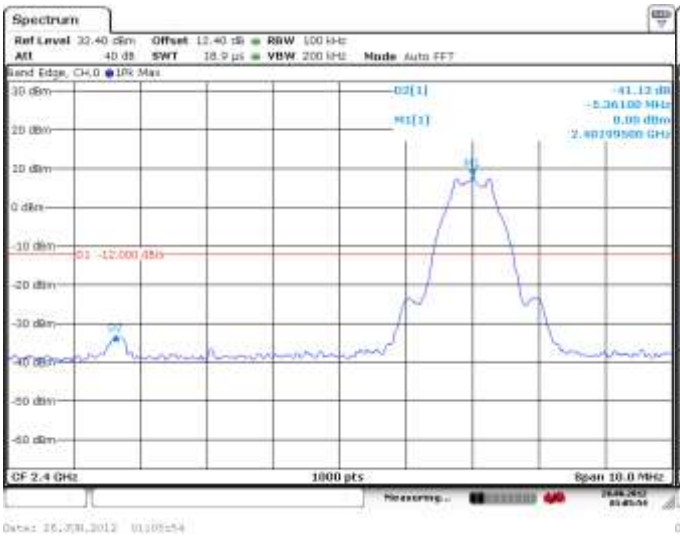
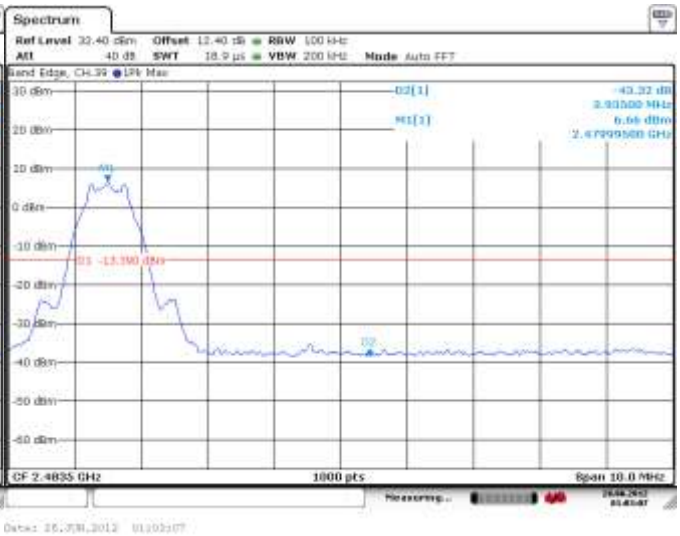


Figure 4-63: Band Edge Compliance LE, Channel 39



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.247(d) and RSS-210. Channels 0, 20 and 39 were measured.

Channel	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
0	< 8.00	-6.73	-14.73
20	< 8.00	-7.09	-15.09
39	< 8.00	-7.89	-15.89

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

See figures 4-64 to 4-66 for the plots of the peak power spectral density for Channels 0, 20 and 39.

Figure 4-64: Peak Power Spectral Density LE, Channel 0

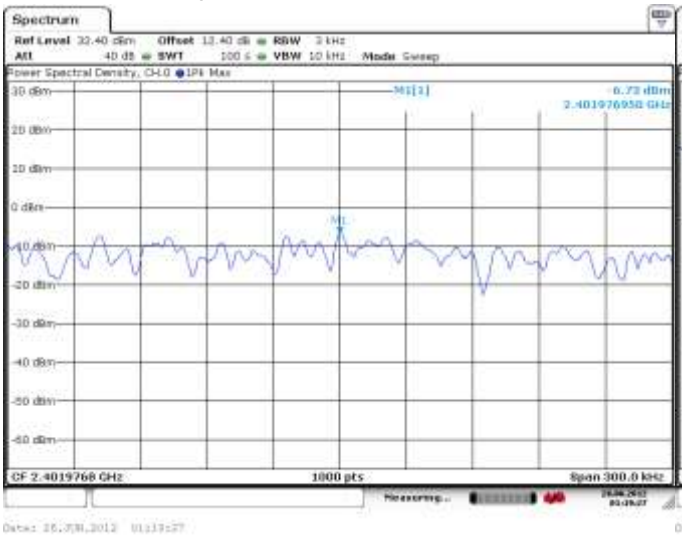


Figure 4-65: Peak Power Spectral Density LE, Channel 20

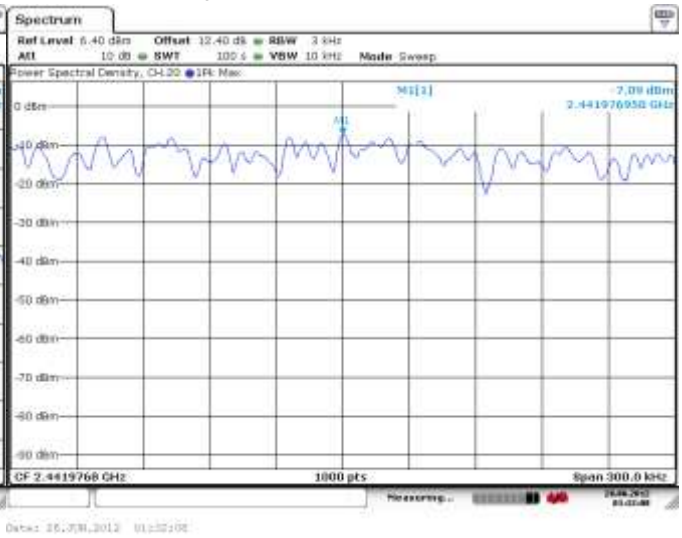
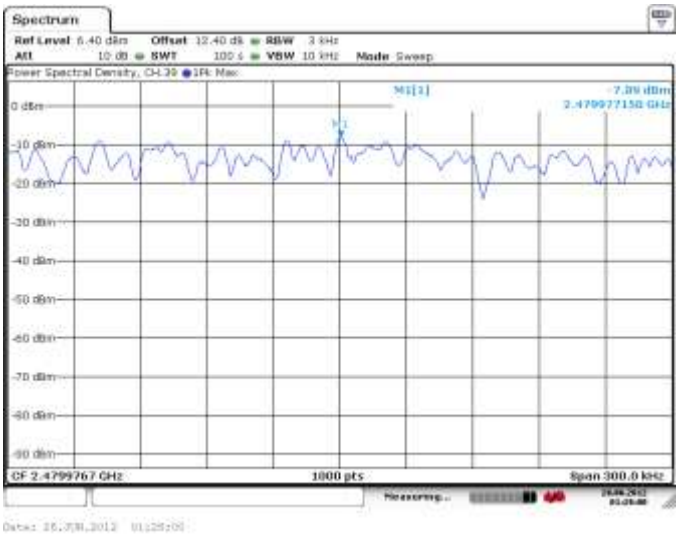


Figure 4-66: Peak Power Spectral Density LE, Channel 39



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

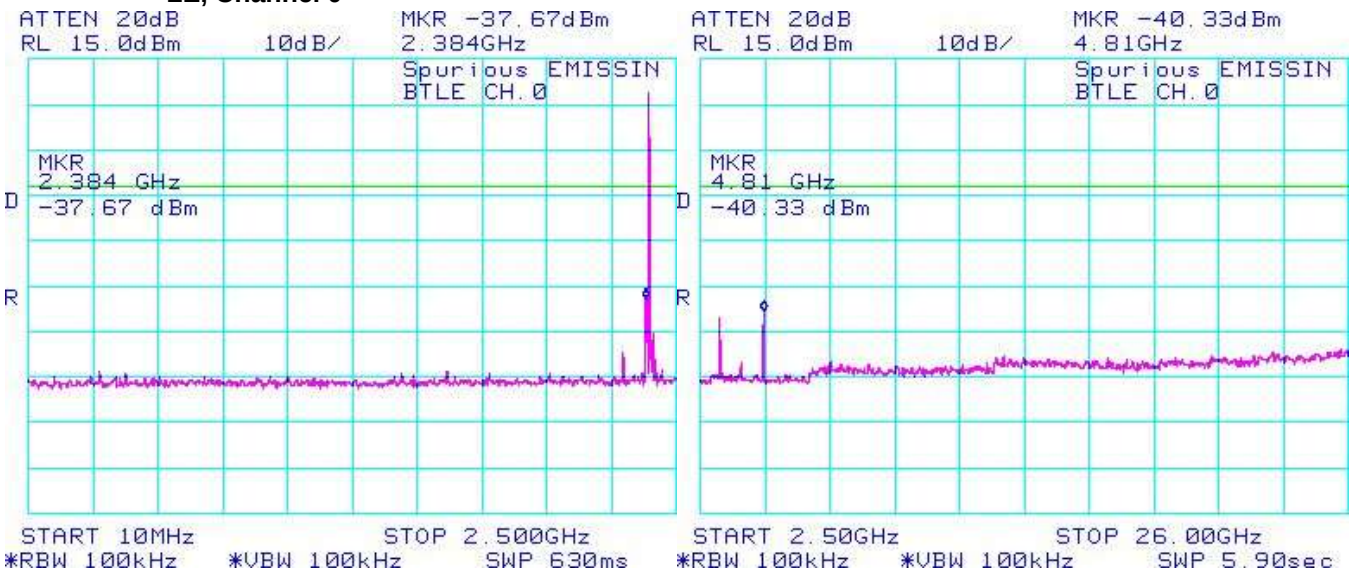
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0, 20 and 39 were measured. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
0	7.75	-37.67	-45.42	-20
20	7.30	-38.50	-45.80	-20
39	6.28	-38.67	-44.95	-20

The emissions were in the NF.

See figures 4-67 to 4-69 for the plots of the spurious RF conducted emissions for Channels 0, 20 and 39.

Figure 4-67: Spurious Conducted RF Emissions LE, Channel 0



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 4-68 : Spurious Conducted RF Emissions

LE, Channel 20

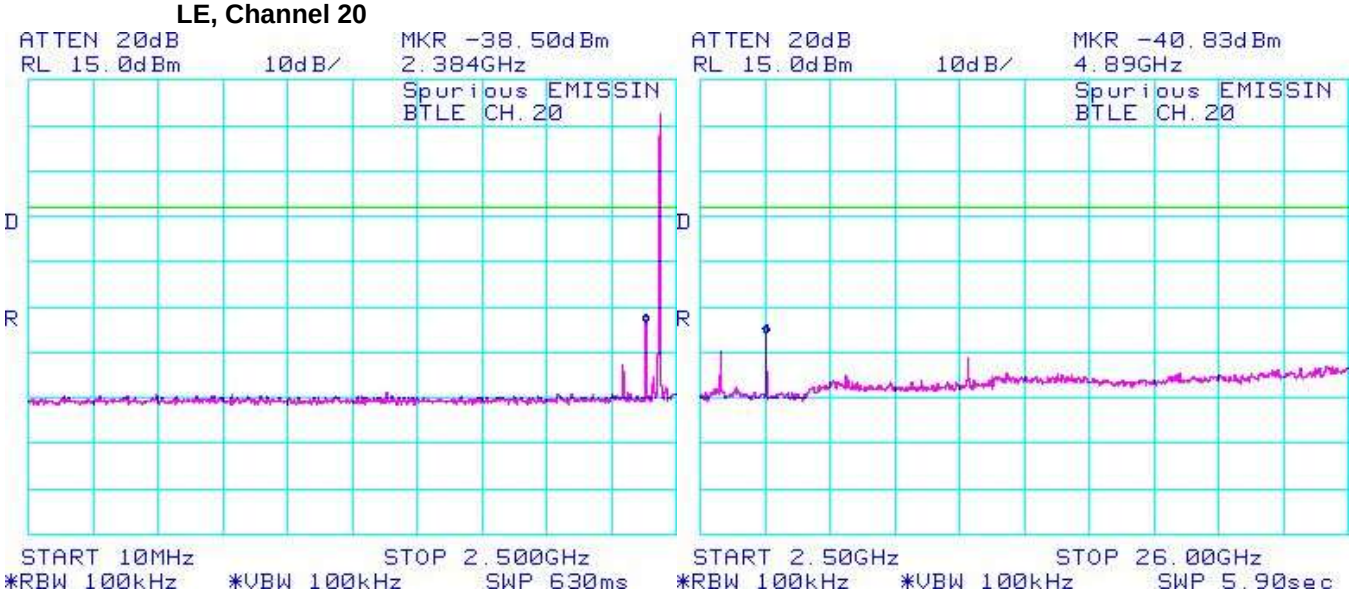
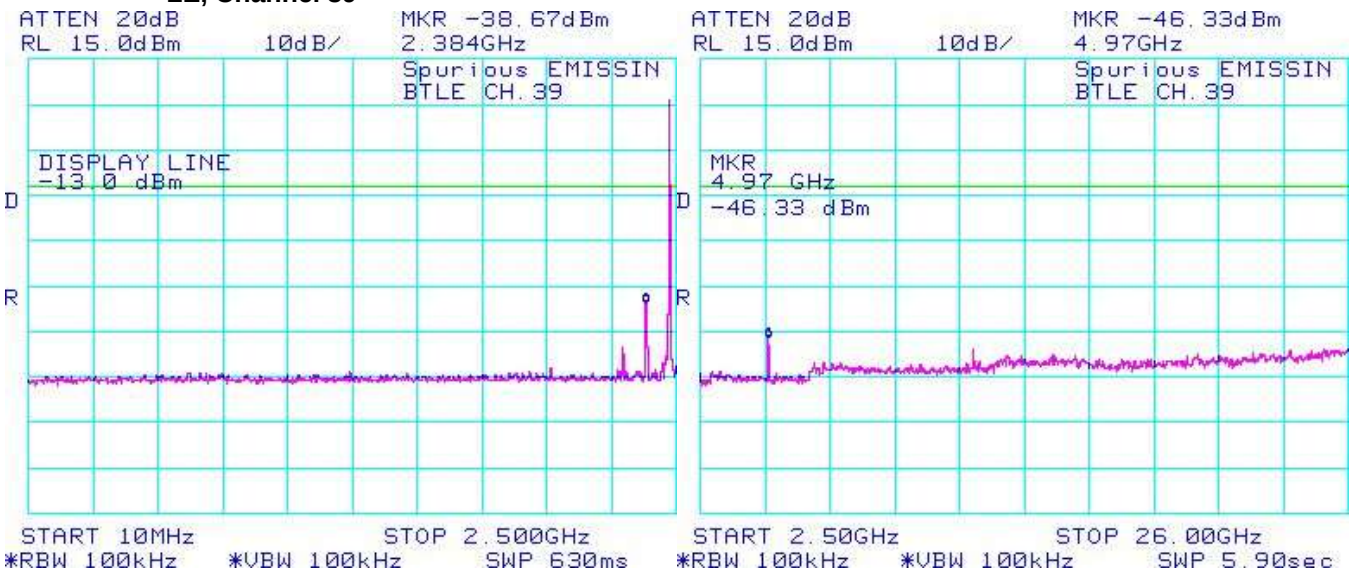


Figure 4-69: Spurious Conducted RF Emissions

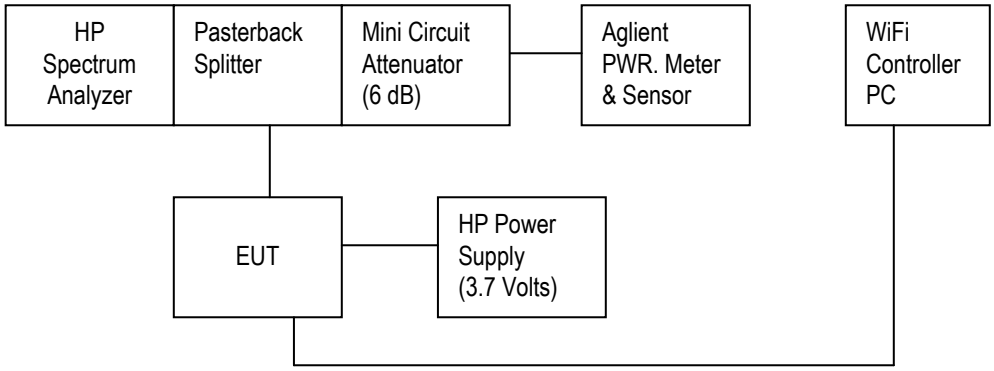
LE, Channel 39



APPENDIX 5 – 802.11b/g/n CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11b/g/n RF Conducted Emission Test Results

Test Setup Diagram



A reference offset of 20.4 dB was applied to the spectrum analyzer and 6.6 dB was applied to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: June 21, 2012
The measurements on the BlackBerry® smartphone were performed by Kevin Guo.

The environmental test conditions were: Temperature: 23 ºC
Relative Humidity: 40 %

802.11b/g/n RF Conducted Emission Test Results cont'd

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
1	1 Mbps	≥ 500	10.01
	5.5 Mbps	≥ 500	9.72
	11 Mbps	≥ 500	9.61
	6 Mbps	≥ 500	16.03
	24 Mbps	≥ 500	16.41
	54 Mbps	≥ 500	15.38
	MCS 0	≥ 500	16.76
	MCS 4	≥ 500	17.32
	MCS 7	≥ 500	16.35
6	1 Mbps	≥ 500	10.01
	5.5 Mbps	≥ 500	9.88
	11 Mbps	≥ 500	10.13
	6 Mbps	≥ 500	16.24
	24 Mbps	≥ 500	16.33
	54 Mbps	≥ 500	15.56
	MCS 0	≥ 500	16.24
	MCS 4	≥ 500	16.53
	MCS 7	≥ 500	15.81
11	1 Mbps	≥ 500	10.01
	5.5 Mbps	≥ 500	10.33
	11 Mbps	≥ 500	9.84
	6 Mbps	≥ 500	16.24
	24 Mbps	≥ 500	16.43
	54 Mbps	≥ 500	16.31
	MCS 0	≥ 500	16.85
	MCS 4	≥ 500	17.11
	MCS 7	≥ 500	17.42

802.11b/g/n RF Conducted Emission Test Results cont'd

See figures 5-1 to 5-9 for the plots of the 6 dB bandwidth measurements for Channels 1, 6, and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

Figure 5-1: 6 dB Bandwidth
802.11b, Channel 1, 1 Mbps

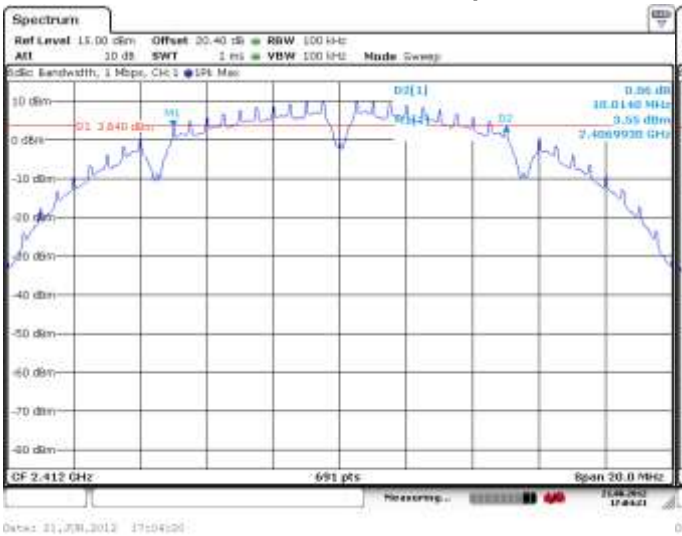


Figure 5-2: 6 dB Bandwidth
802.11b, Channel 6, 1 Mbps

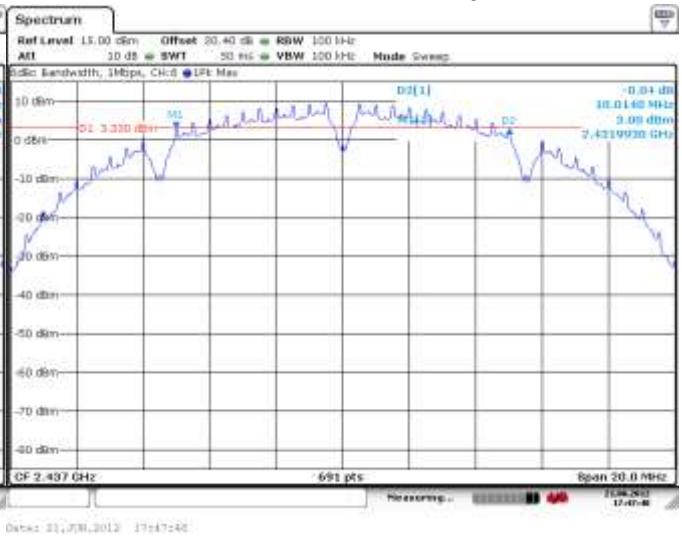


Figure 5-3: 6 dB Bandwidth
802.11b, Channel 11, 1 Mbps

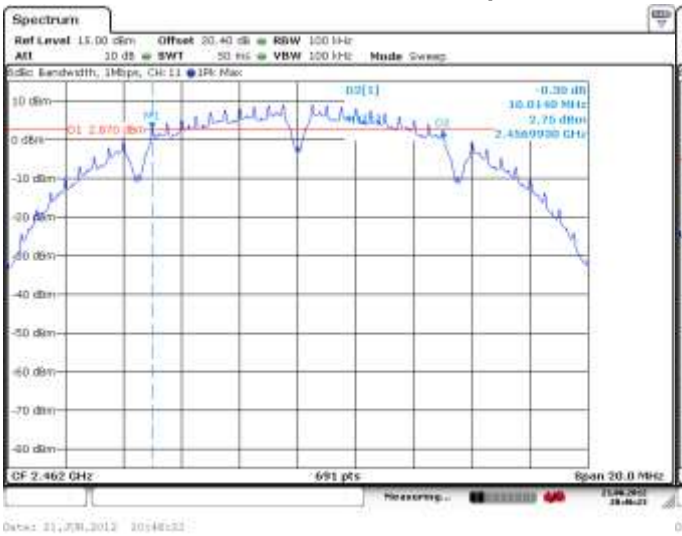
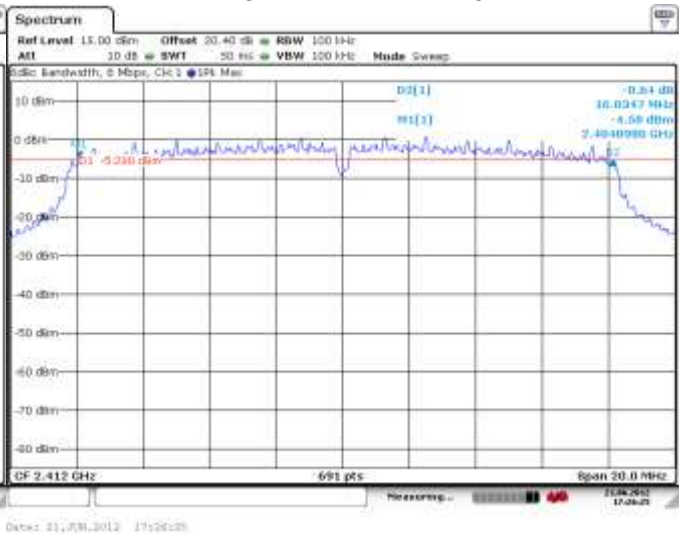


Figure 5-4: 6 dB Bandwidth
802.11g, Channel 1, 6 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-5: 6 dB Bandwidth
802.11g, Channel 6, 6 Mbps

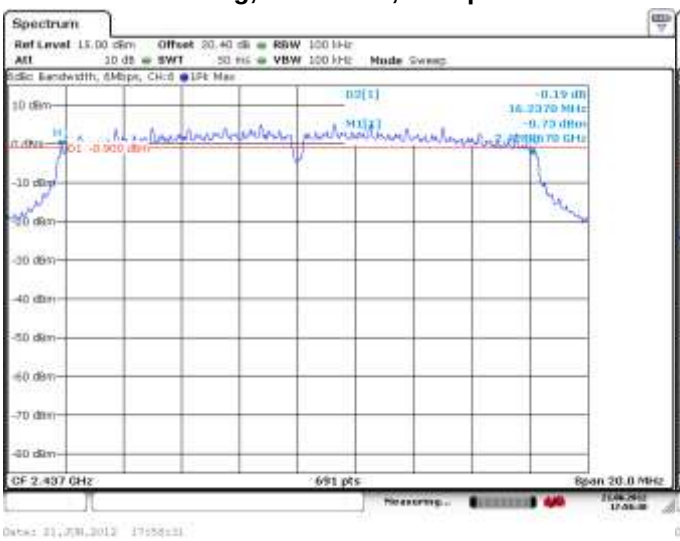


Figure 5-6: 6 dB Bandwidth
802.11g, Channel 11, 6 Mbps

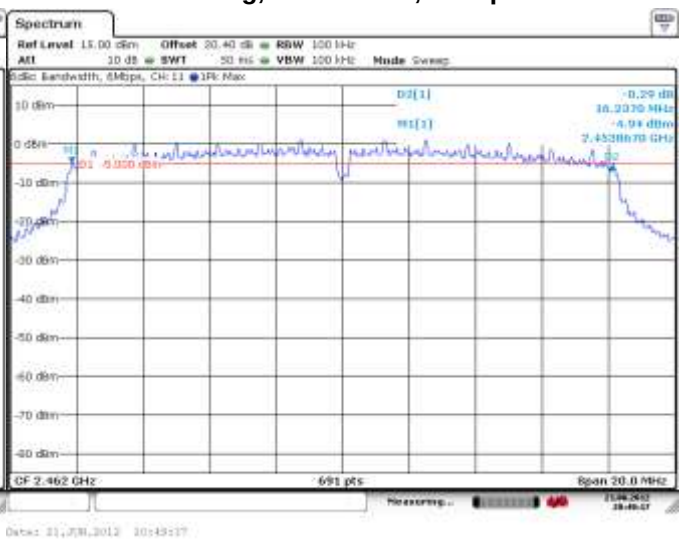


Figure 5-7: 6 dB Bandwidth
802.11n, Channel 1, MCS 0

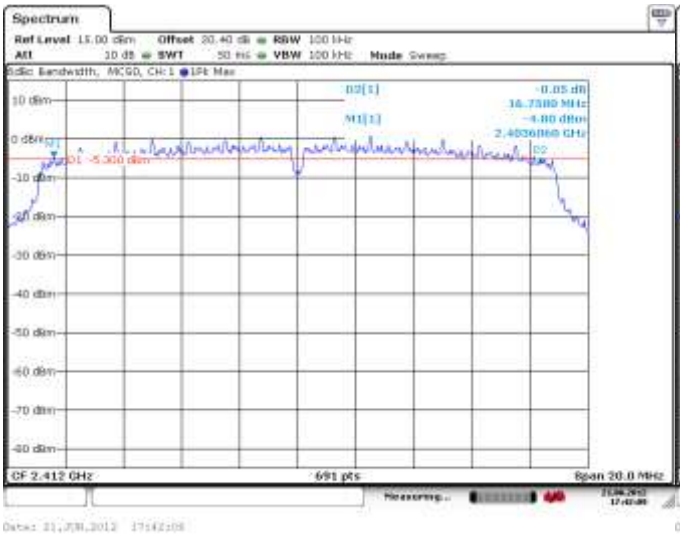


Figure 5-8: 6 dB Bandwidth
802.11n, Channel 6, MCS 0

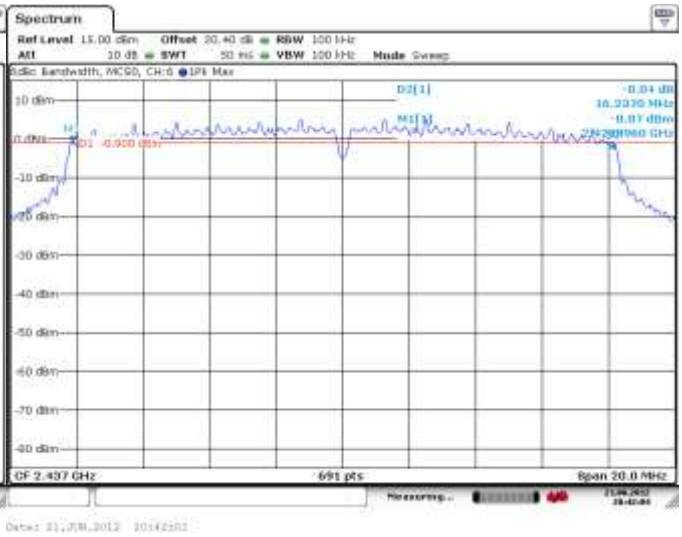
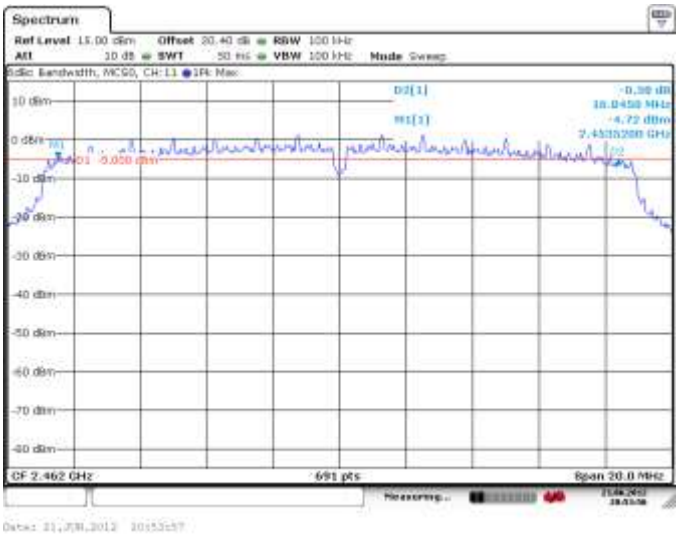


Figure 5-9: 6 dB Bandwidth
802.11n, Channel 11, MCS 0



802.11b/g/n RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.247(b)(3) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode using an Aglient power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
1	1 Mbps	< 1.00	18.82	76.21
	5.5 Mbps	< 1.00	18.79	75.68
	11 Mbps	< 1.00	18.73	74.64
	6 Mbps	< 1.00	12.68	18.54
	24 Mbps	< 1.00	11.80	15.14
	54 Mbps	< 1.00	12.45	17.58
	MCS 0	< 1.00	12.39	17.34
	MCS 4	< 1.00	12.46	17.62
	MCS 7	< 1.00	11.90	15.49
6	1 Mbps	< 1.00	18.43	69.66
	5.5 Mbps	< 1.00	18.41	69.34
	11 Mbps	< 1.00	18.38	68.87
	6 Mbps	< 1.00	16.82	48.08
	24 Mbps	< 1.00	16.25	42.17
	54 Mbps	< 1.00	12.83	19.19
	MCS 0	< 1.00	16.33	42.95
	MCS 4	< 1.00	15.75	37.58
	MCS 7	< 1.00	11.05	12.74

802.11b/g/n RF Conducted Emission Test Results cont'd

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
11	1 Mbps	< 1.00	17.88	61.38
	5.5 Mbps	< 1.00	17.76	59.70
	11 Mbps	< 1.00	17.72	59.16
	6 Mbps	< 1.00	12.03	15.96
	24 Mbps	< 1.00	11.92	15.56
	54 Mbps	< 1.00	11.76	15.00
	MCS 0	< 1.00	11.74	14.93
	MCS 4	< 1.00	11.63	14.55
	MCS 7	< 1.00	10.80	12.02

802.11b/g/n RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Channels 1 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
1	1 Mbps	< -20	-48.80	-28.80
	5.5 Mbps	< -20	-48.00	-28.00
	11 Mbps	< -20	-48.42	-28.42
	6 Mbps	< -20	-27.50	-7.50
	24 Mbps	< -20	-29.02	-9.02
	54 Mbps	< -20	-29.22	-9.22
	MCS 0	< -20	-25.01	-5.01
	MCS 4	< -20	-28.17	-8.17
	MCS 7	< -20	-28.35	-8.35
11	1 Mbps	< -20	-51.83	-31.83
	5.5 Mbps	< -20	-53.93	-33.93
	11 Mbps	< -20	-54.12	-34.12
	6 Mbps	< -20	-45.06	-25.06
	24 Mbps	< -20	-46.98	-26.98
	54 Mbps	< -20	-47.21	-27.21
	MCS 0	< -20	-43.55	-23.55
	MCS 4	< -20	-45.08	-25.08
	MCS 7	< -20	-45.87	-25.87

See figures 5-10 to 5-15 for the plots of the band edge compliance measurements for Channels 1 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-10: Band Edge Compliance
802.11b, Channel 1, 1 Mbps

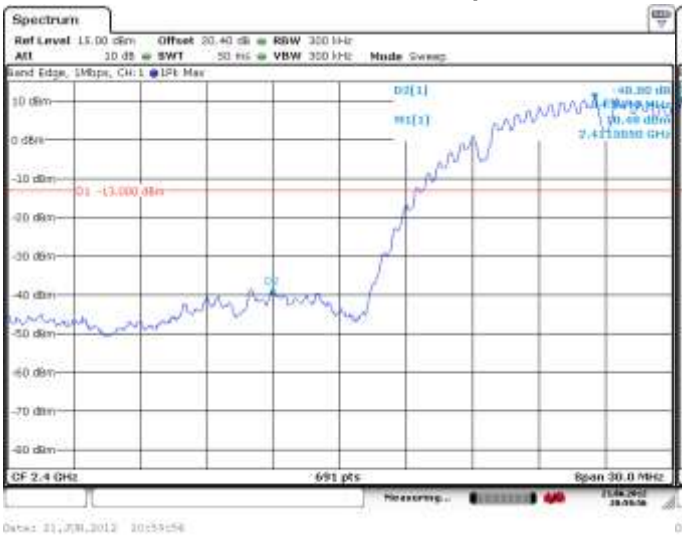


Figure 5-11: Band Edge Compliance
802.11b, Channel 11, 1 Mbps

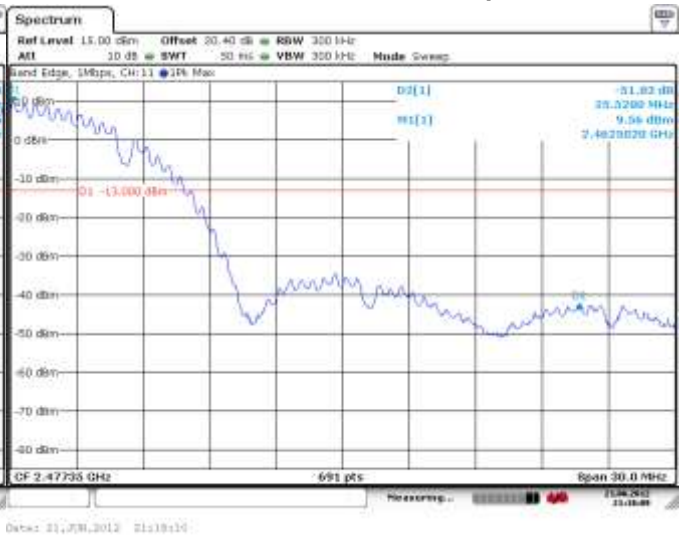
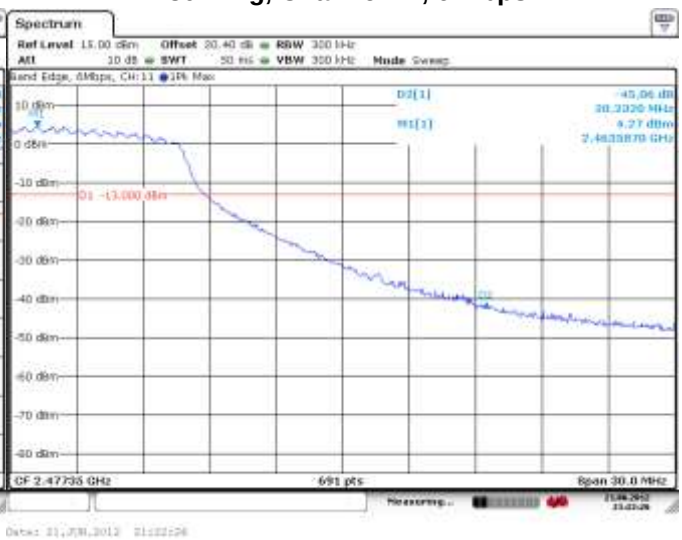


Figure 5-12: Band Edge Compliance
802.11g, Channel 1, 6 Mbps

Figure 5-13: Band Edge Compliance
802.11g, Channel 11, 6 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-14: Band Edge Compliance 802.11n, Channel 1, MCS 0

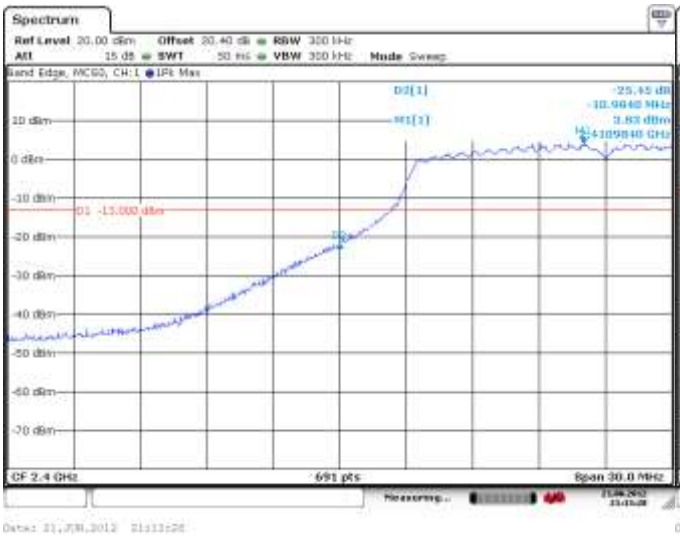
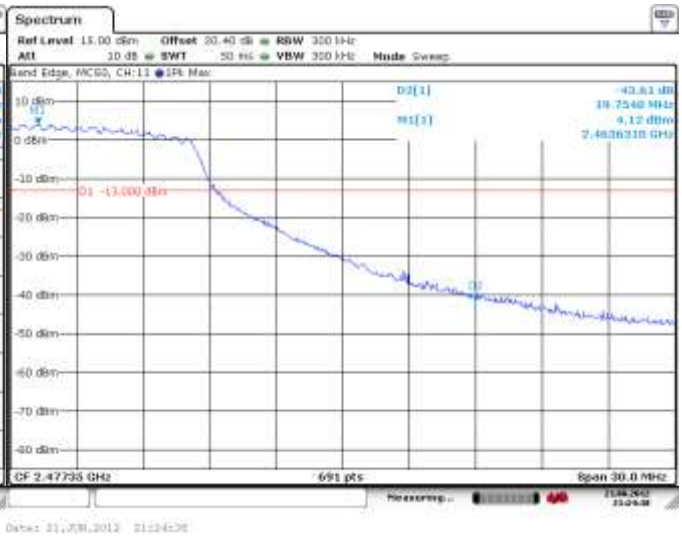


Figure 5-15: Band Edge Compliance 802.11n, Channel 11, MCS 0



802.11b/g/n RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.247(d) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
1	1 Mbps	< 8.00	-3.18	-11.18
	5.5 Mbps	< 8.00	-5.17	-13.17
	11 Mbps	< 8.00	-4.33	-12.33
	6 Mbps	< 8.00	-11.41	-19.41
	24 Mbps	< 8.00	-11.00	-19.00
	54 Mbps	< 8.00	-11.70	-19.70
	MCS 0	< 8.00	-11.90	-19.90
	MCS 4	< 8.00	-11.67	-19.67
	MCS 7	< 8.00	-11.50	-19.50
6	1 Mbps	< 8.00	-3.20	-11.20
	5.5 Mbps	< 8.00	-4.83	-12.83
	11 Mbps	< 8.00	-4.50	-12.50
	6 Mbps	< 8.00	-6.43	-14.43
	24 Mbps	< 8.00	-7.67	-15.67
	54 Mbps	< 8.00	-10.83	-18.83
	MCS 0	< 8.00	-7.12	-15.12
	MCS 4	< 8.00	-8.67	-16.67
	MCS 7	< 8.00	-11.83	-19.83
11	1 Mbps	< 8.00	-3.45	-11.45
	5.5 Mbps	< 8.00	-2.46	-10.46
	11 Mbps	< 8.00	-5.97	-13.97
	6 Mbps	< 8.00	-11.05	-19.05
	24 Mbps	< 8.00	-11.38	-19.38
	54 Mbps	< 8.00	-12.04	-20.04
	MCS 0	< 8.00	-10.20	-18.20
	MCS 4	< 8.00	-11.66	-19.66
	MCS 7	< 8.00	-11.80	-19.80

802.11b/g/n RF Conducted Emission Test Results cont'd

See figures 5-16 to 5-24 for the plots of the peak power spectral density for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 for 802.11n mode.

Figure 5-16: Peak Power Spectral Density 802.11b, Channel 1, 1 Mbps

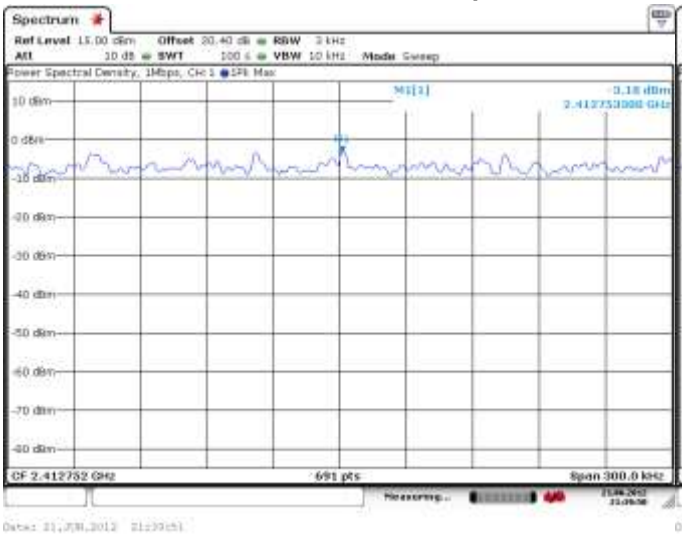


Figure 5-17: Peak Power Spectral Density 802.11b, Channel 6, 1 Mbps

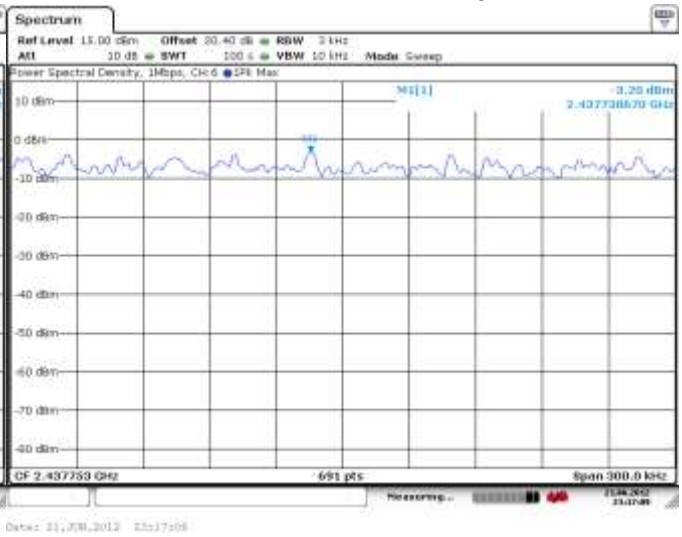
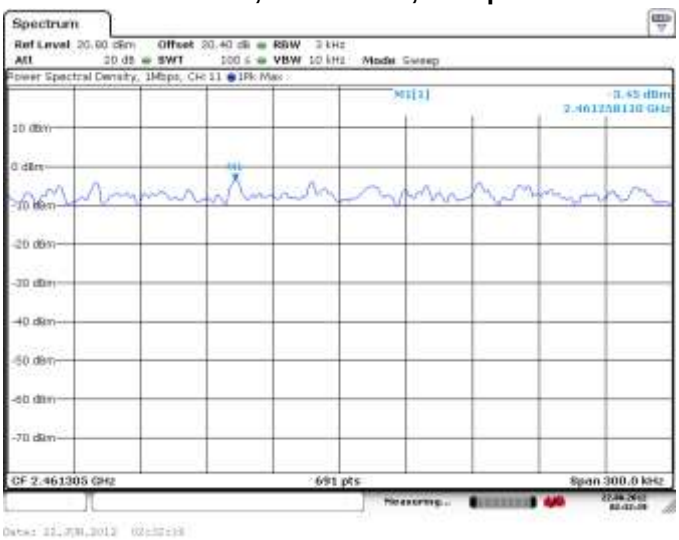


Figure 5-18: Peak Power Spectral Density 802.11b, Channel 11, 1 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-19: Peak Power Spectral Density 802.11g, Channel 1, 6 Mbps

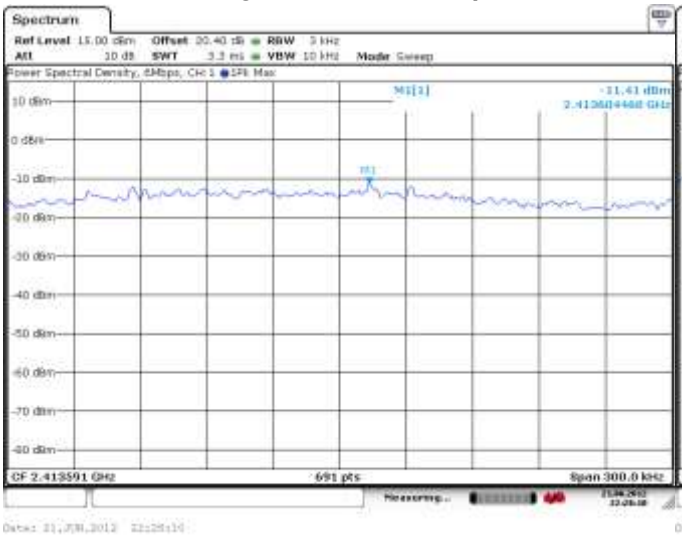


Figure 5-20: Peak Power Spectral Density 802.11g, Channel 6, 6 Mbps

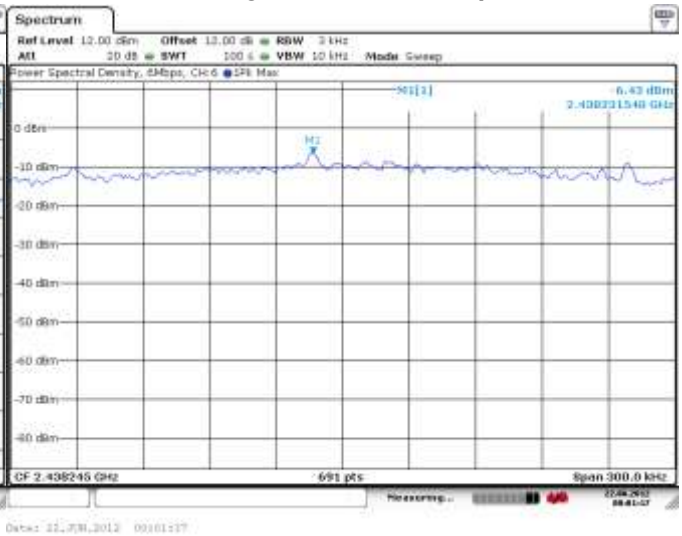
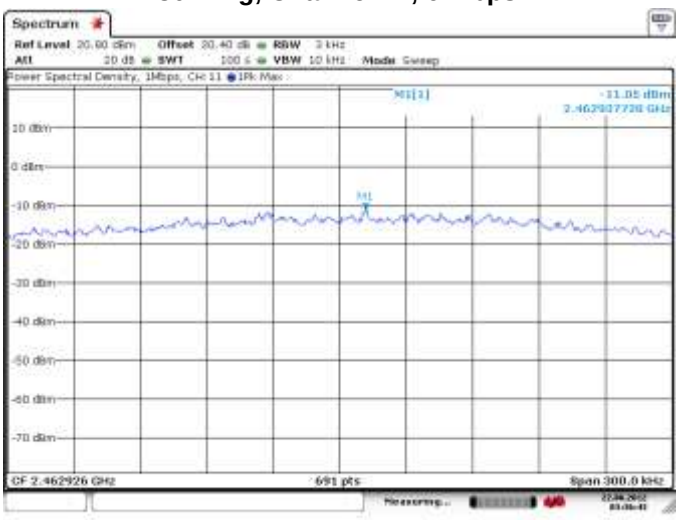


Figure 5-21: Peak Power Spectral Density 802.11g, Channel 11, 6 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-22: Peak Power Spectral Density
802.11n, Channel 1, MCS 0

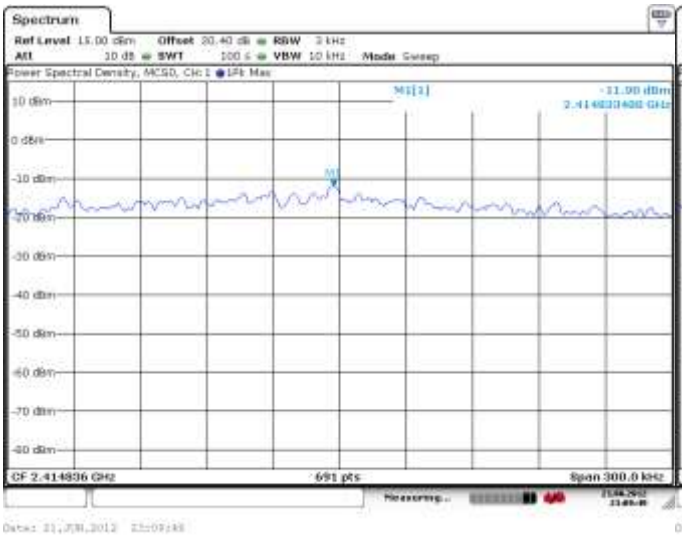


Figure 5-23: Peak Power Spectral Density
802.11n, Channel 6, MCS 0

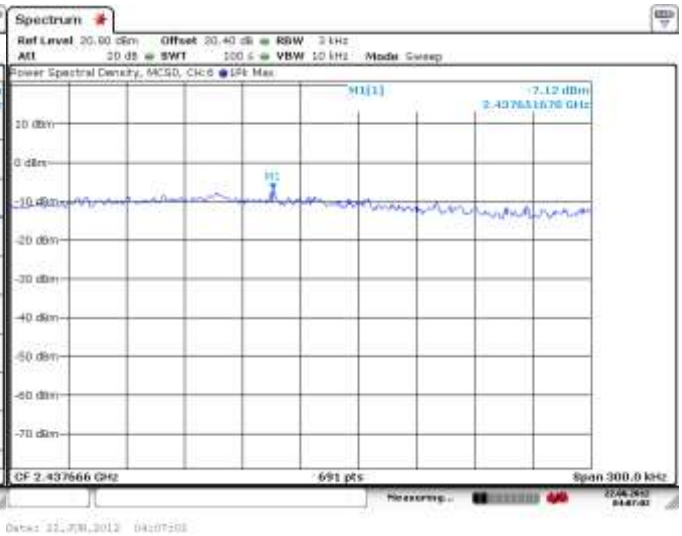
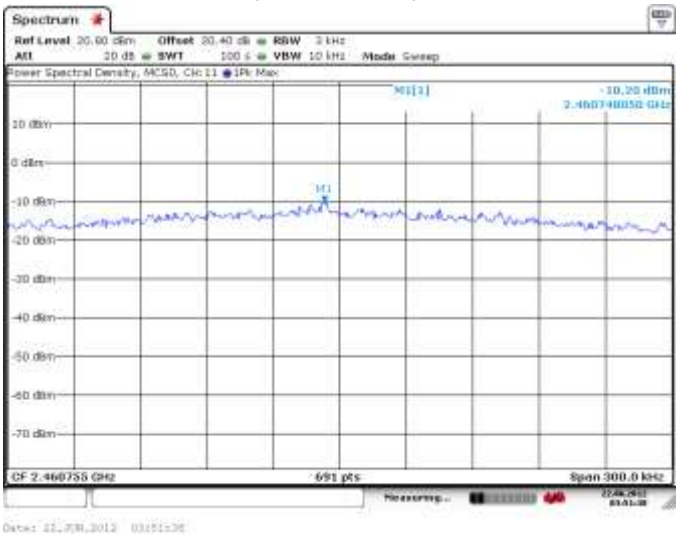


Figure 5-24: Peak Power Spectral Density
802.11n, Channel 11, MCS 0



802.11b/g/n RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
1	1 Mbps	18.82	-46.33	-65.15	-20
	5.5 Mbps	18.79	-45.33	-64.12	-20
	11 Mbps	18.73	-47.67	-66.40	-20
	6 Mbps	12.68	-49.50	-62.18	-20
	24 Mbps	11.80	-49.00	-60.80	-20
	54 Mbps	12.45	-49.72	-62.17	-20
	MCS 0	12.39	-49.33	-61.72	-20
	MCS 4	12.46	-49.65	-62.11	-20
	MCS 7	11.90	-50.10	-62.00	-20
6	1 Mbps	18.43	-48.33	-66.76	-20
	5.5 Mbps	18.41	-49.50	-67.91	-20
	11 Mbps	18.38	-50.81	-69.19	-20
	6 Mbps	16.82	-50.49	-67.31	-20
	24 Mbps	16.25	-49.62	-65.87	-20
	54 Mbps	12.83	-50.77	-63.60	-20
	MCS 0	16.33	-48.83	-65.16	-20
	MCS 4	15.75	-49.35	-65.10	-20
	MCS 7	11.05	-50.03	-61.08	-20

802.11b/g/n RF Conducted Emission Test Results cont'd

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
11	1 Mbps	17.88	-48.67	-66.55	-20
	5.5 Mbps	17.76	-49.01	-66.77	-20
	11 Mbps	17.72	-49.45	-67.17	-20
	6 Mbps	12.03	-50.33	-62.36	-20
	24 Mbps	11.92	-50.33	-62.25	-20
	54 Mbps	11.76	-50.00	-61.76	-20
	MCS 0	11.74	-49.00	-60.74	-20
	MCS 4	11.63	-50.13	-61.76	-20
	MCS 7	10.80	-51.50	-62.30	-20

The emissions were in the NF.

See figures 5-25 to 5-33 for the plots of the spurious RF conducted emissions for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-25: Spurious Conducted RF Emissions

802.11b, Channel 1, 1 Mbps

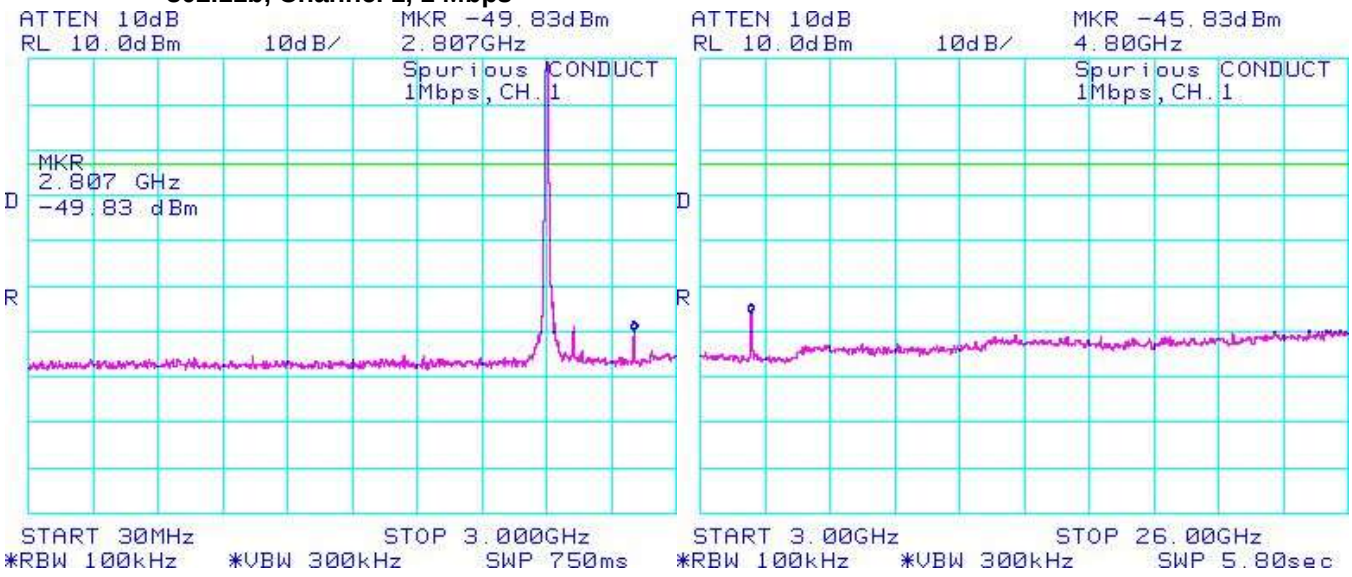
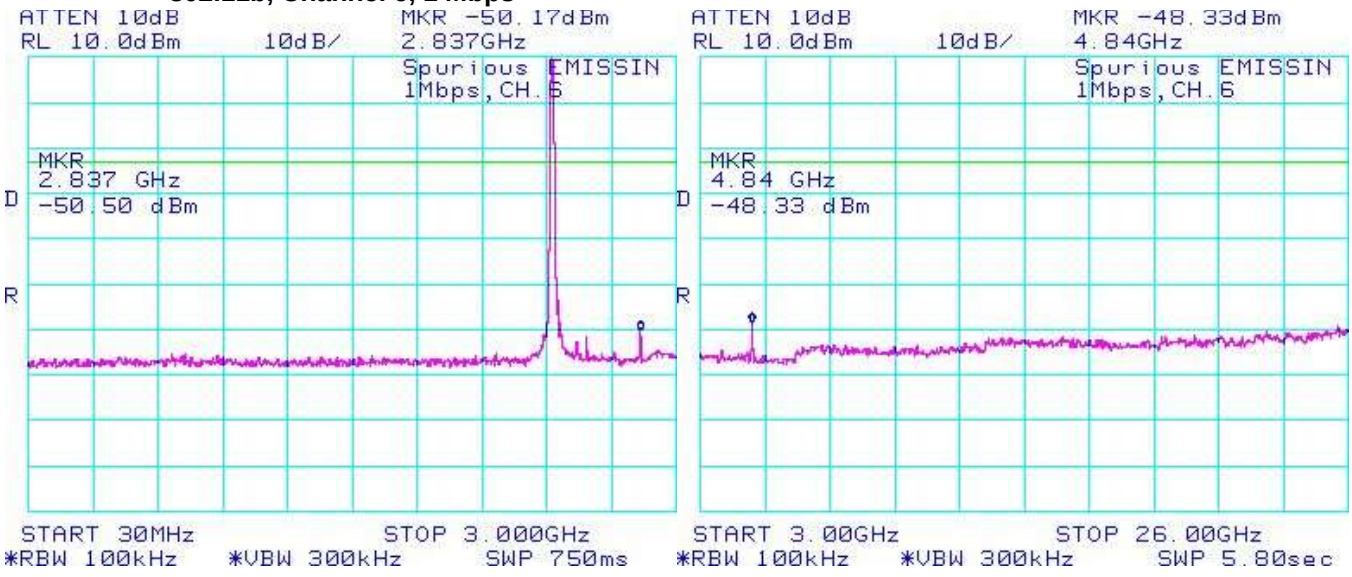


Figure 5-26 : Spurious Conducted RF Emissions

802.11b, Channel 6, 1 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-27: Spurious Conducted RF Emissions

802.11b, Channel 11, 1 Mbps

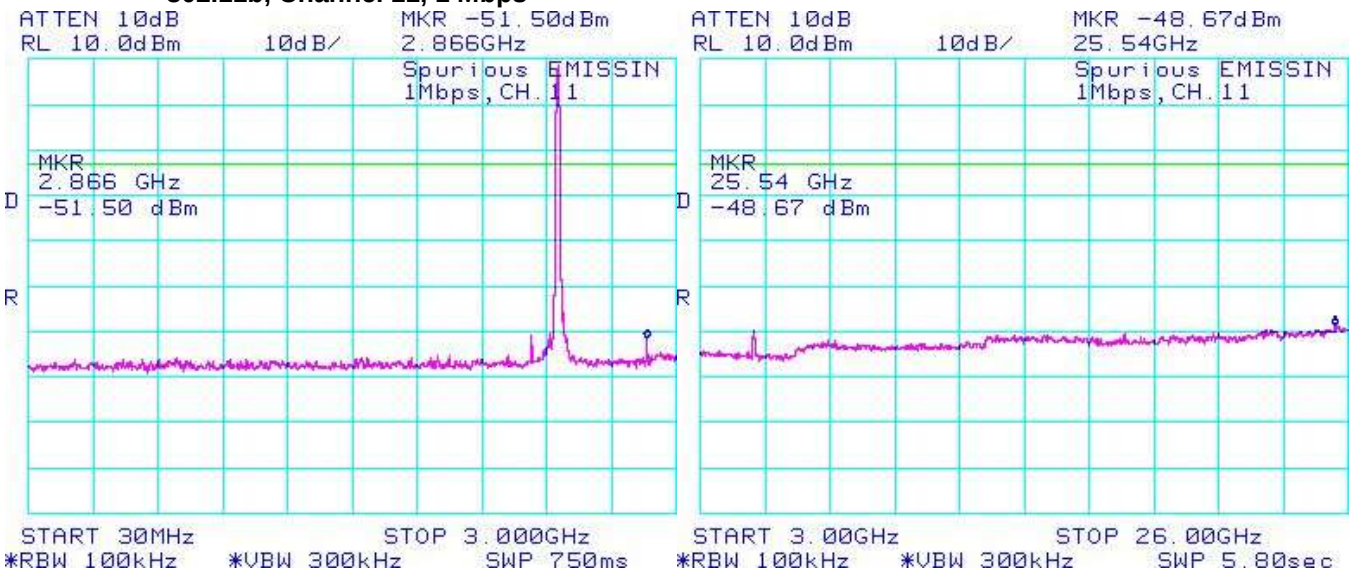
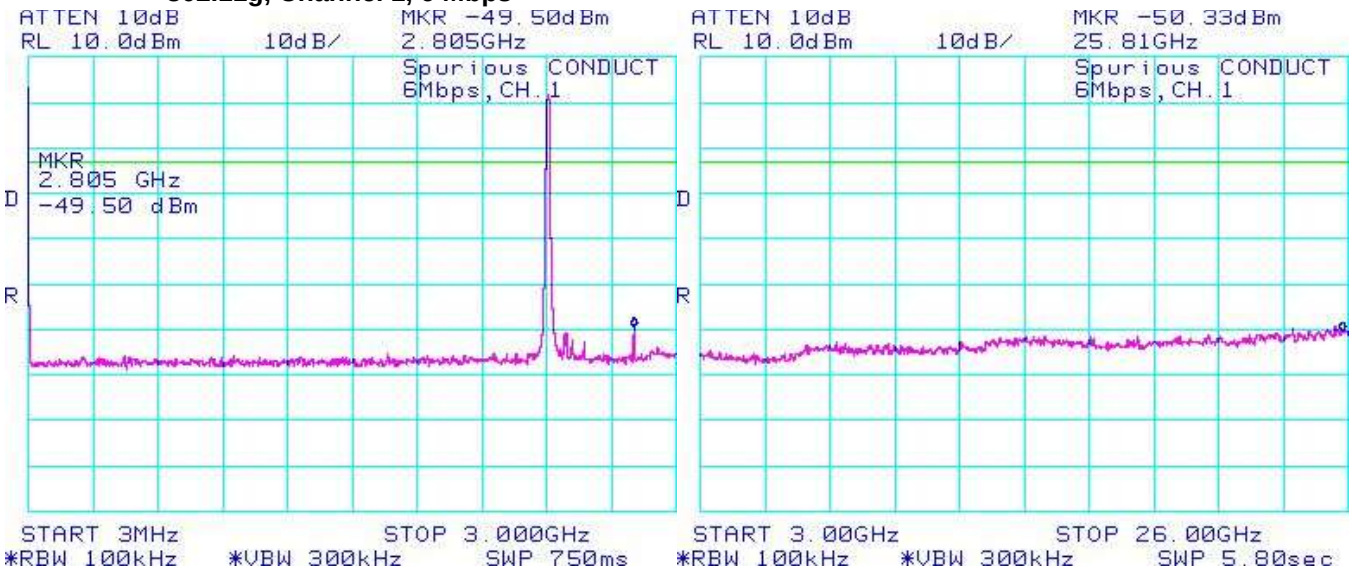


Figure 5-28: Spurious Conducted RF Emissions

802.11g, Channel 1, 6 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-29: Spurious Conducted RF Emissions
802.11g, Channel 6, 6 Mbps

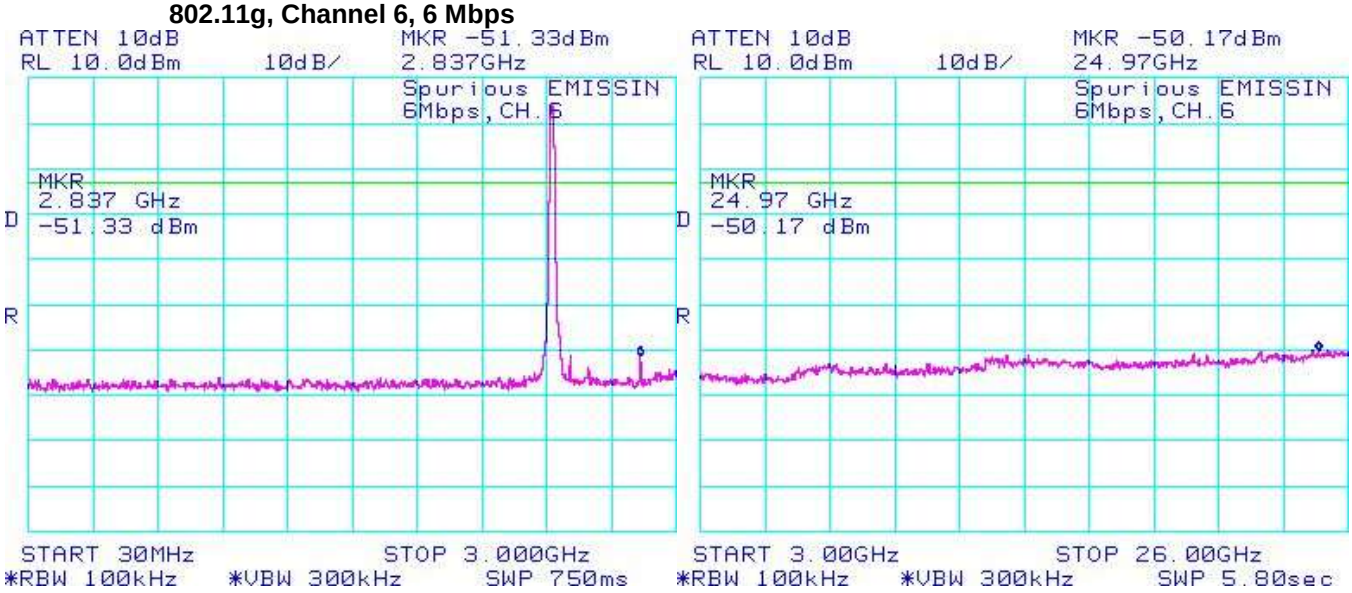
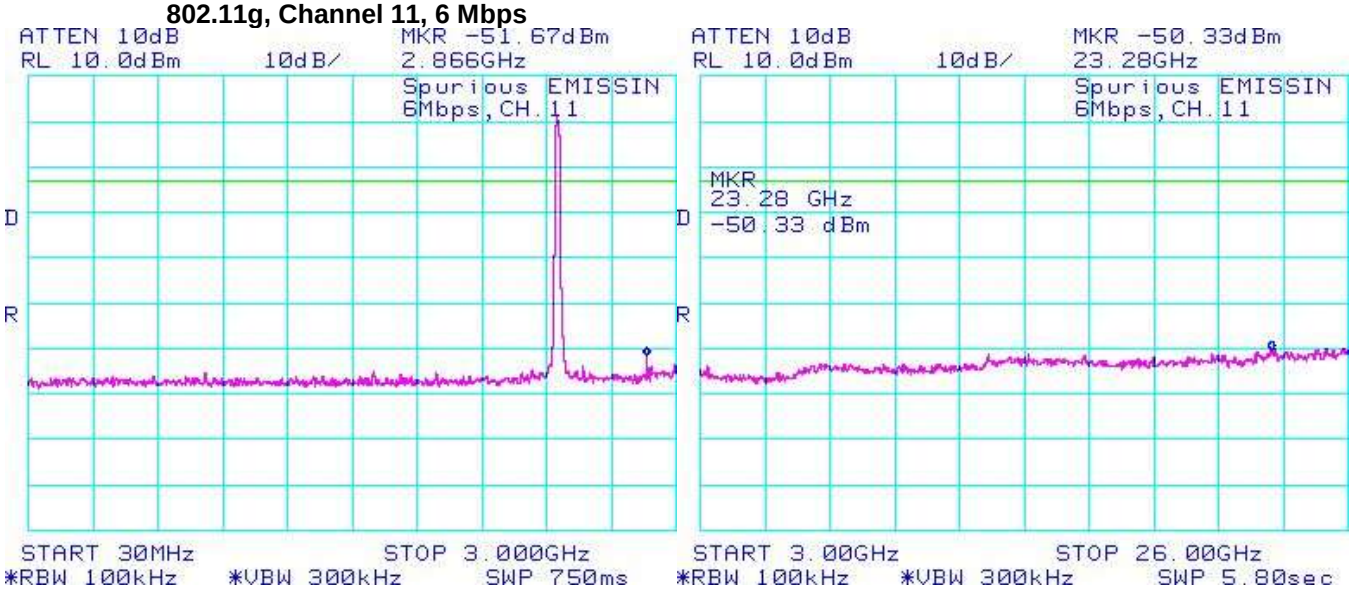


Figure 5-30: Spurious Conducted RF Emissions
802.11g, Channel 11, 6 Mbps



802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-31: Spurious Conducted RF Emissions
802.11n, Channel 1, MCS 0

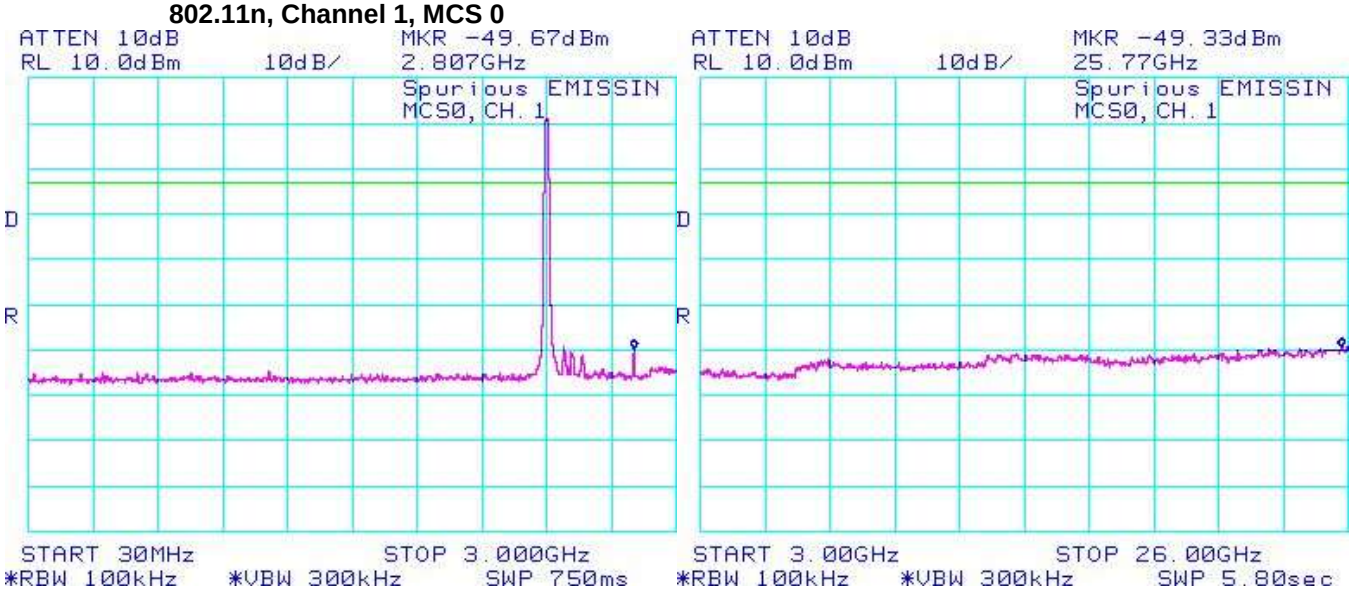
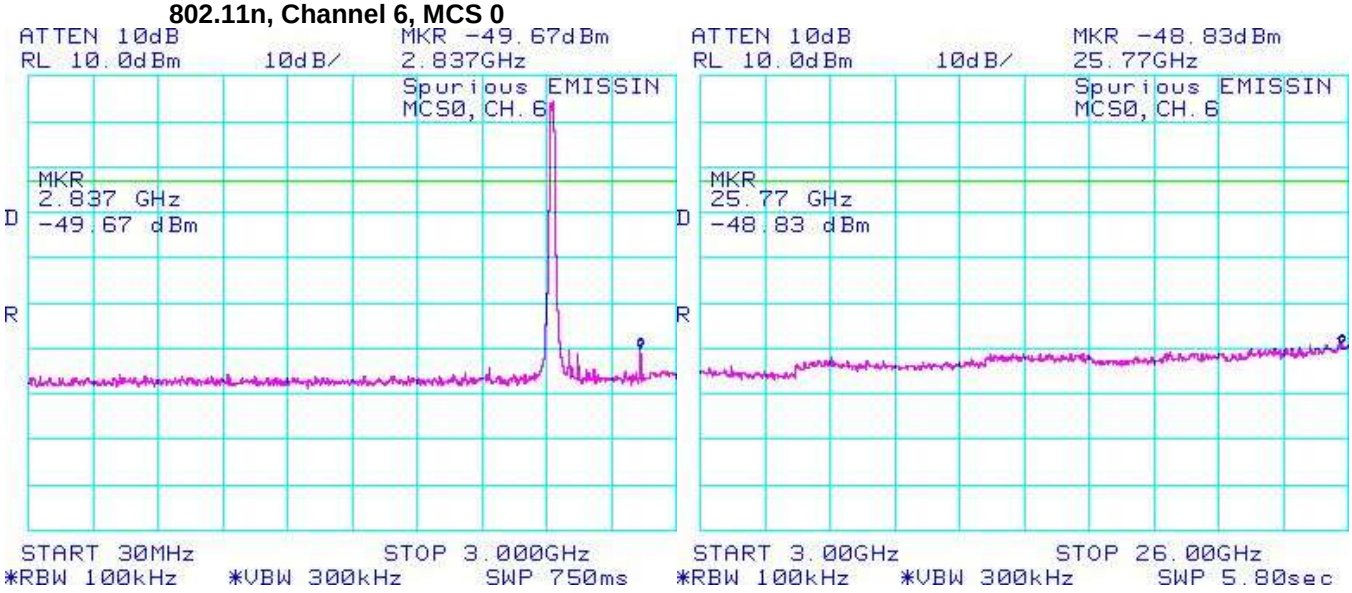
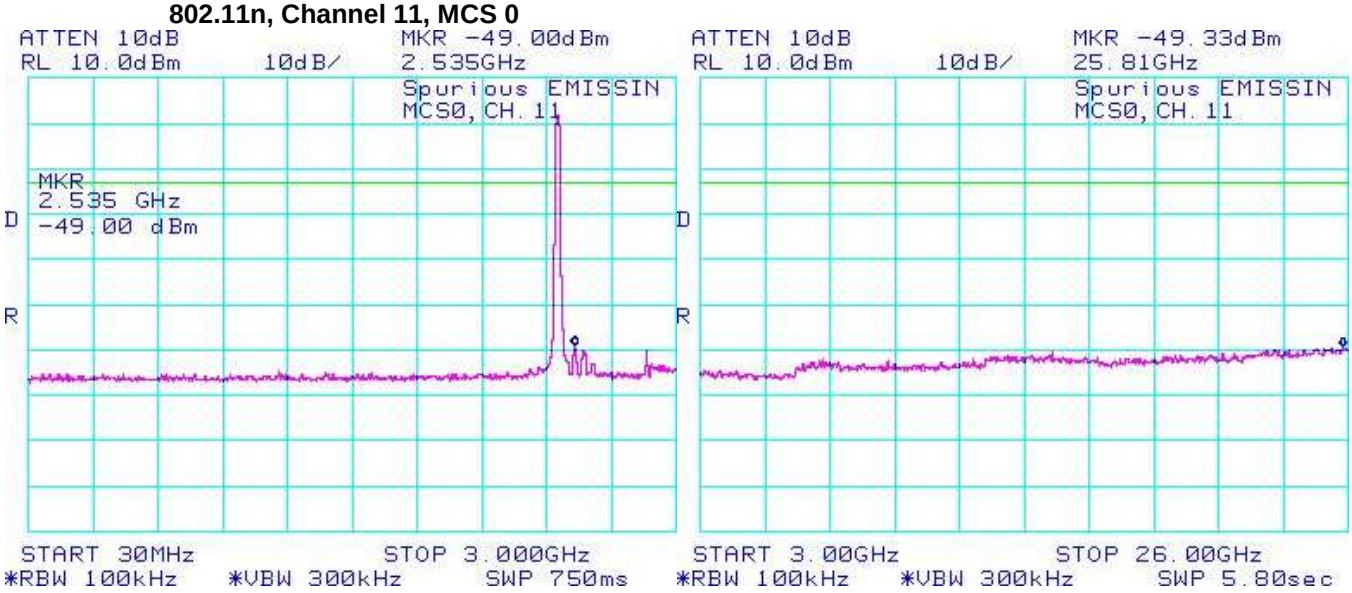


Figure 5-32: Spurious Conducted RF Emissions
802.11n, Channel 6, MCS 0



802.11b/g/n RF Conducted Emission Test Results cont'd

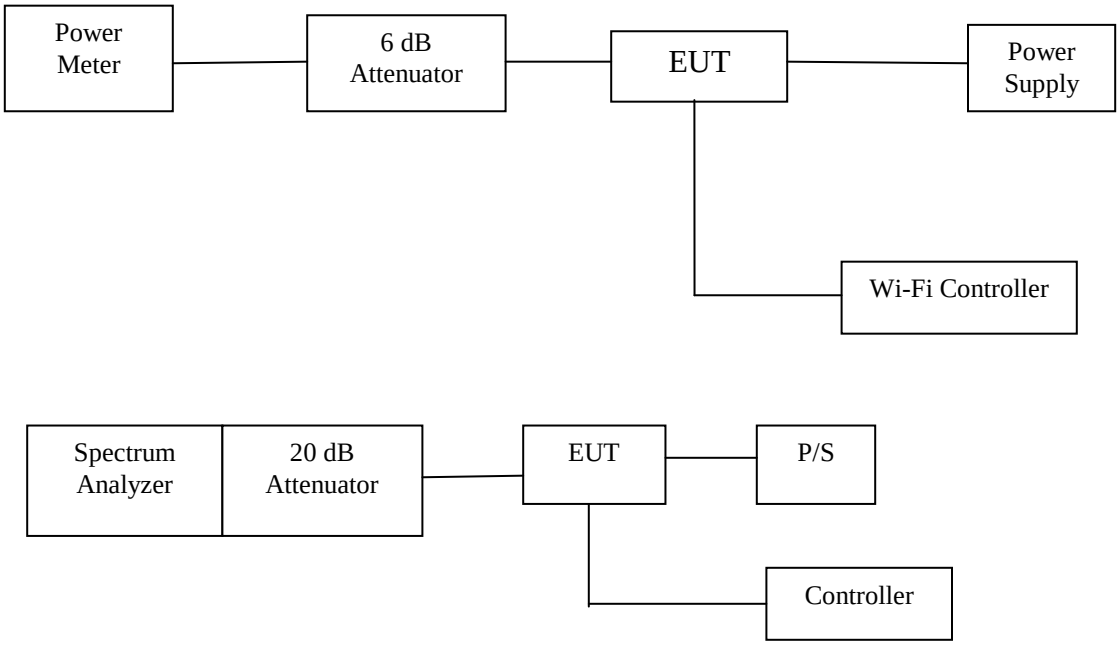
Figure 5-33: Spurious Conducted RF Emissions
802.11n, Channel 11, MCS 0



APPENDIX 6 – 802.11a/n CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11a/n RF Conducted Emission Test Results

Test Setup Diagram



A reference offset of 8.9 dB was applied to the spectrum analyzer and 7.4 dB to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: June 25 and October 29, 2012.
The measurements were performed by Berkin Can.

The environmental test conditions were:	Temperature:	24 ºC
	Relative Humidity:	42 %

802.11a RF Conducted Emission Test Results cont'd

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	6 Mbps	>= 500	15.66
	24 Mbps	>= 500	16.35
	54 Mbps	>= 500	16.41
44	6 Mbps	>= 500	15.80
	24 Mbps	>= 500	16.13
	54 Mbps	>= 500	16.34
48	6 Mbps	>= 500	15.77
	24 Mbps	>= 500	16.03
	54 Mbps	>= 500	16.39
52	6 Mbps	>= 500	15.80
	24 Mbps	>= 500	16.41
	54 Mbps	>= 500	16.38
60	6 Mbps	>= 500	15.77
	24 Mbps	>= 500	16.35
	54 Mbps	>= 500	16.41
64	6 Mbps	>= 500	15.75
	24 Mbps	>= 500	16.35
	54 Mbps	>= 500	16.38
100	6 Mbps	>= 500	15.75
	24 Mbps	>= 500	16.38
	54 Mbps	>= 500	16.35

802.11a RF Conducted Emission Test Results cont'd

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
140	6 Mbps	>= 500	16.04
	24 Mbps	>= 500	16.38
	54 Mbps	>= 500	16.41
149	6 Mbps	>= 500	15.75
	24 Mbps	>= 500	16.41
	54 Mbps	>= 500	16.41
157	6 Mbps	>= 500	15.77
	24 Mbps	>= 500	16.35
	54 Mbps	>= 500	16.35
161	6 Mbps	>= 500	15.77
	24 Mbps	>= 500	16.32
	54 Mbps	>= 500	16.41
165	6 Mbps	>= 500	15.77
	24 Mbps	>= 500	16.38
	54 Mbps	>= 500	16.44

See figures 6-1 to 6-12 for the plots of the 6 dB bandwidth measurements for Channel 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 at 6 Mbps each for 802.11a mode.

802.11n RF Conducted Emission Test Results

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 an MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS 0	>= 500	16.56
	MCS 4	>= 500	17.28
	MCS 7	>= 500	17.60
64	MCS 0	>= 500	16.04
	MCS 4	>= 500	17.25
	MCS 7	>= 500	17.60
165	MCS 0	>= 500	16.30
	MCS 4	>= 500	17.54
	MCS 7	>= 500	17.57

See figures 6-13 to 6-15 for the plots of the 6 dB bandwidth measurements for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

802.11a RF Conducted Emission Test Results cont'd

Figure 6-1: 6 dB Bandwidth
802.11a, Channel 36, 6 Mbps

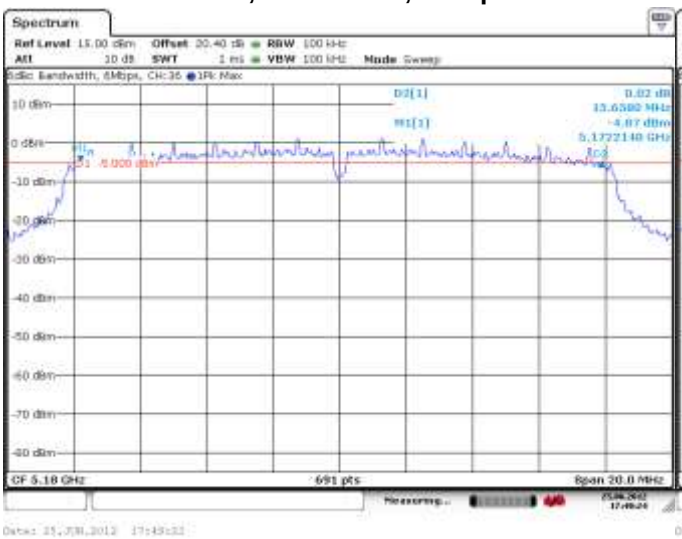


Figure 6-2: 6 dB Bandwidth
802.11a, Channel 44, 6 Mbps

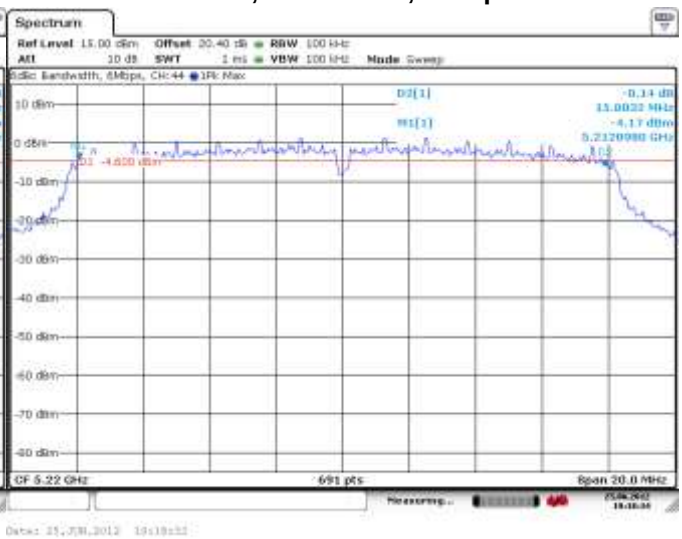


Figure 6-3: 6 dB Bandwidth
802.11a, Channel 48, 6 Mbps

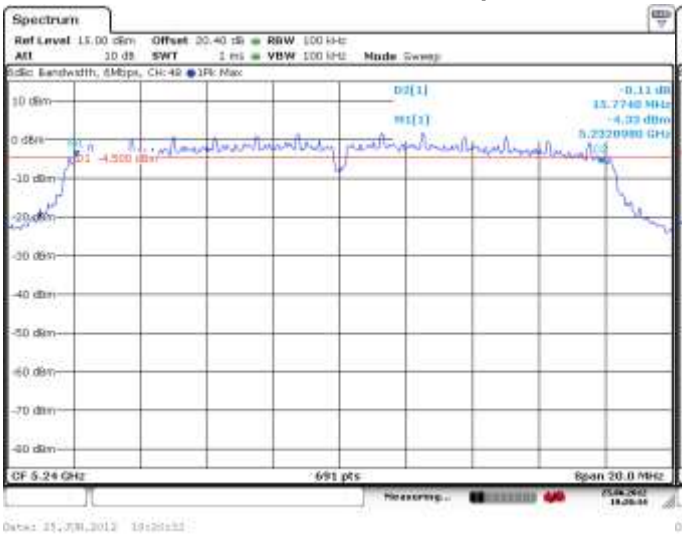
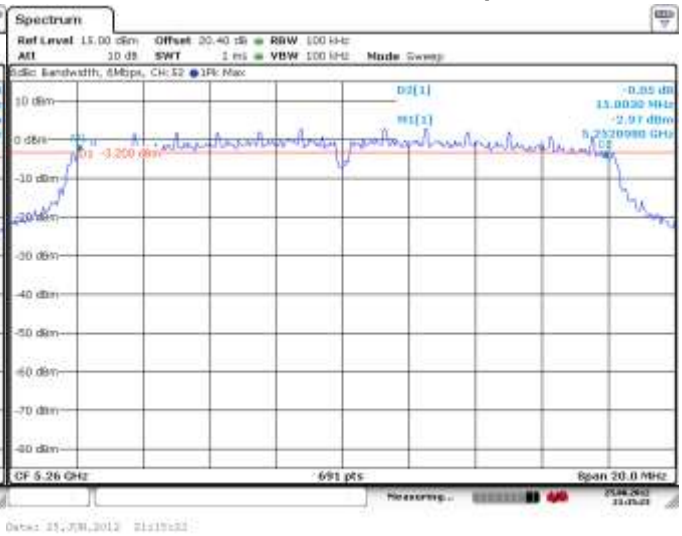


Figure 6-4: 6 dB Bandwidth
802.11a, Channel 52, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-5: 6 dB Bandwidth
802.11a, Channel 60, 6 Mbps

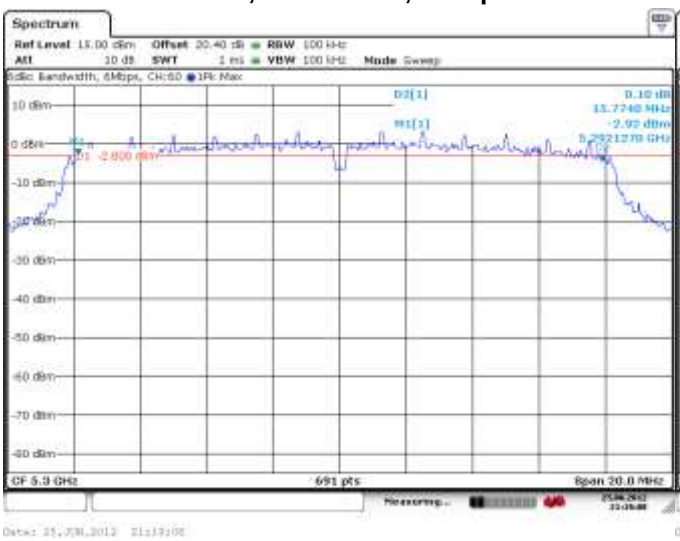


Figure 6-6: 6 dB Bandwidth
802.11a, Channel 64, 6 Mbps

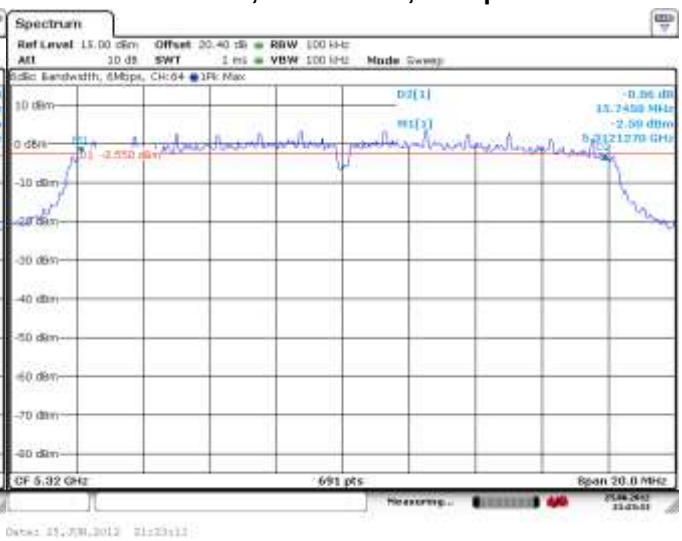


Figure 6-7: 6 dB Bandwidth
802.11a, Channel 100, 6 Mbps

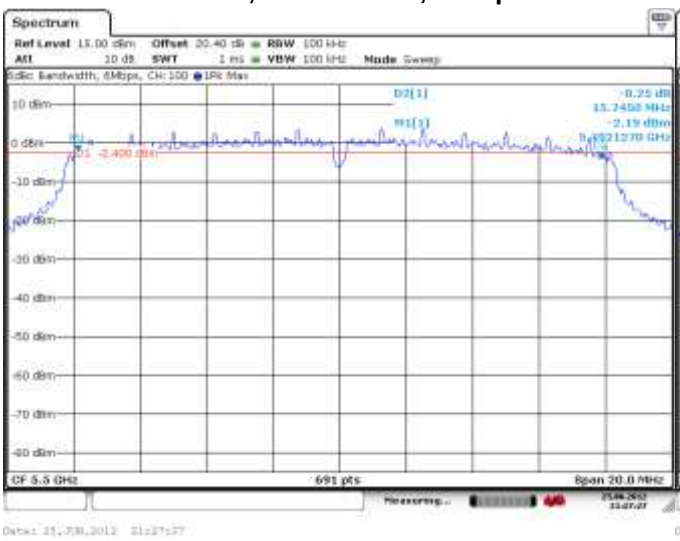
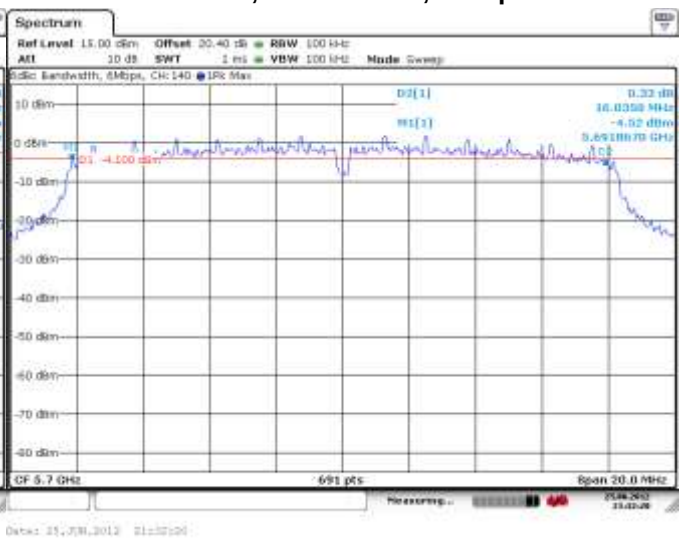


Figure 6-8: 6 dB Bandwidth
802.11a, Channel 140, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-9: 6 dB Bandwidth
802.11a, Channel 149, 6 Mbps

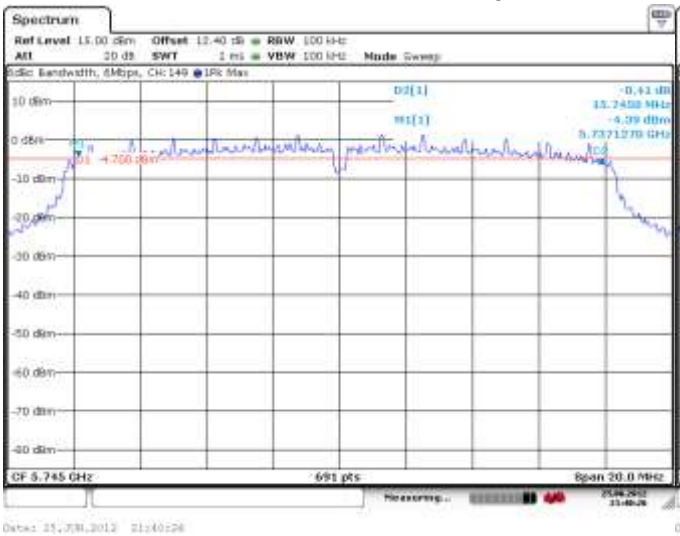


Figure 6-10: 6 dB Bandwidth
802.11a, Channel 157, 6 Mbps

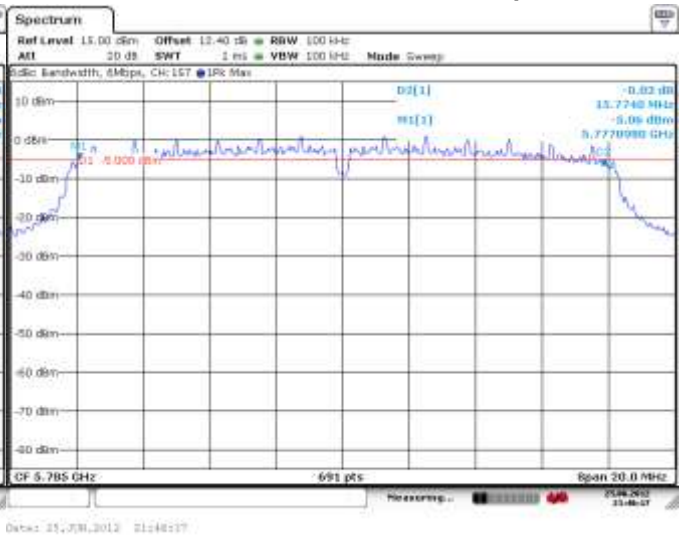


Figure 6-11: 6 dB Bandwidth
802.11a, Channel 161, 6 Mbps

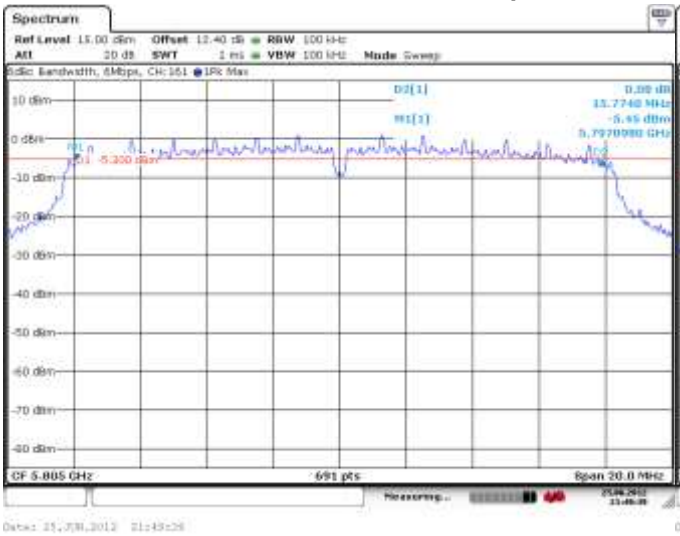
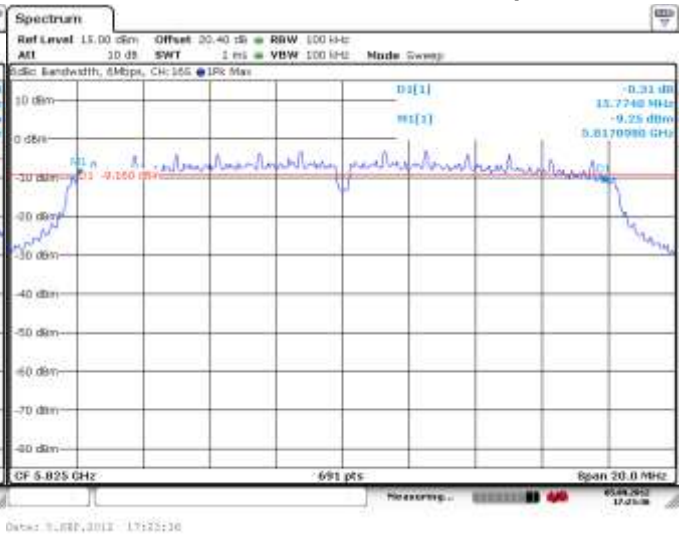


Figure 6-12: 6 dB Bandwidth
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 6-13: 6 dB Bandwidth
802.11n, Channel 36, MCS 0

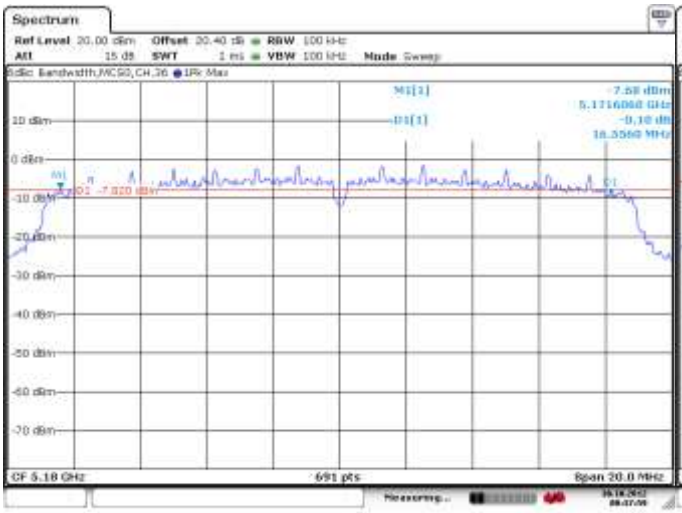


Figure 6-14: 6 dB Bandwidth
802.11n, Channel 64, MCS 0

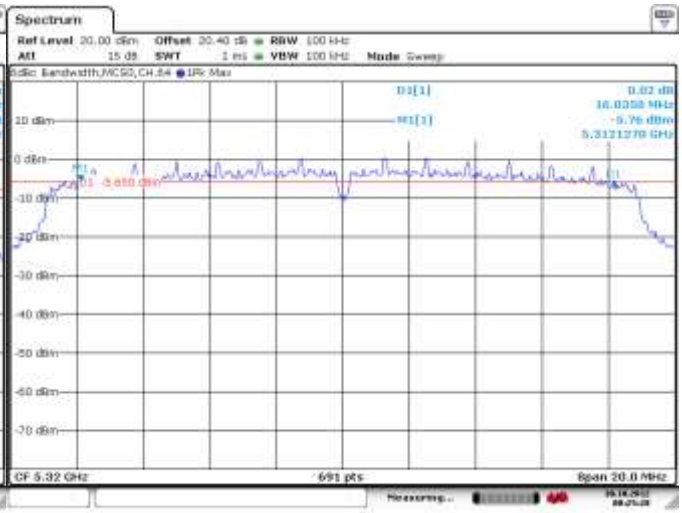
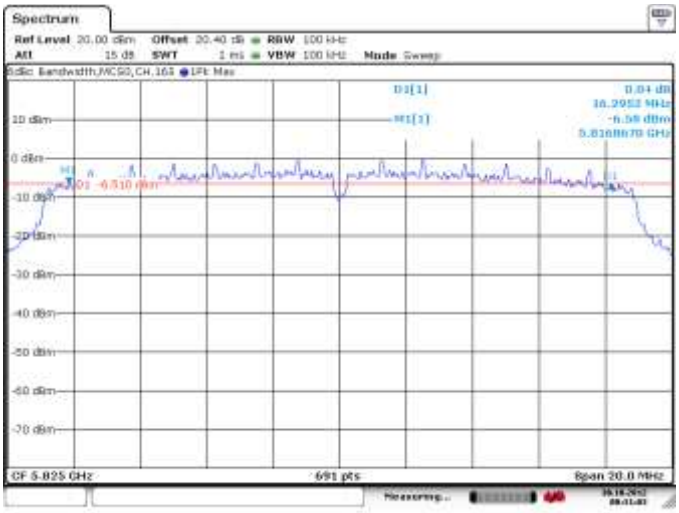


Figure 6-15: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



802.11a RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured for 802.11a mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
36	6 Mbps	< 1.00	12.30	16.98
	24 Mbps	< 1.00	12.28	16.90
	54 Mbps	< 1.00	11.84	15.28
44	6 Mbps	< 1.00	12.53	17.91
	24 Mbps	< 1.00	12.45	17.58
	54 Mbps	< 1.00	12.06	16.07
48	6 Mbps	< 1.00	12.72	18.71
	24 Mbps	< 1.00	12.69	18.58
	54 Mbps	< 1.00	12.22	16.67
52	6 Mbps	< 1.00	13.85	24.27
	24 Mbps	< 1.00	13.94	24.77
	54 Mbps	< 1.00	12.45	17.58
60	6 Mbps	< 1.00	14.32	27.04
	24 Mbps	< 1.00	14.23	26.49
	54 Mbps	< 1.00	12.84	19.23
64	6 Mbps	< 1.00	14.51	28.25
	24 Mbps	< 1.00	14.48	28.05
	54 Mbps	< 1.00	13.02	20.04
100	6 Mbps	< 1.00	14.63	29.04
	24 Mbps	< 1.00	14.77	29.99
	54 Mbps	< 1.00	13.09	20.37

802.11a RF Conducted Emission Test Results cont'd

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
140	6 Mbps	< 1.00	12.93	19.63
	24 Mbps	< 1.00	13.15	20.65
	54 Mbps	< 1.00	11.48	14.06
149	6 Mbps	< 1.00	12.37	17.26
	24 Mbps	< 1.00	12.47	17.66
	54 Mbps	< 1.00	10.86	12.19
157	6 Mbps	< 1.00	12.17	16.48
	24 Mbps	< 1.00	12.07	16.11
	54 Mbps	< 1.00	10.58	11.43
161	6 Mbps	< 1.00	11.94	15.63
	24 Mbps	< 1.00	11.89	15.45
	54 Mbps	< 1.00	10.45	11.09
165	6 Mbps	< 1.00	9.54	8.99
	24 Mbps	< 1.00	9.46	8.83
	54 Mbps	< 1.00	9.42	8.75

802.11n RF Conducted Emission Test Results

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 64 and 165 were measured for 802.11n mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
36	MCS 0	< 1.00	12.68	18.54
	MCS 4	< 1.00	12.02	15.92
	MCS 7	< 1.00	7.78	6.00
64	MCS 0	< 1.00	14.17	26.12
	MCS 4	< 1.00	13.68	23.33
	MCS 7	< 1.00	8.49	7.06
165	MCS 0	< 1.00	10.74	11.86
	MCS 4	< 1.00	10.12	10.28
	MCS 7	< 1.00	7.46	5.57

802.11a RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 52, 64, 100, 149, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-44.89	-24.89
	24 Mbps	< -20	-47.88	-27.88
	54 Mbps	< -20	-46.04	-26.04
48	6 Mbps	< -20	-20.10	-0.10
	24 Mbps	< -20	-20.65	-0.65
	54 Mbps	< -20	-21.94	-1.94
52	6 Mbps	< -20	-20.33	-0.33
	24 Mbps	< -20	-21.67	-1.67
	54 Mbps	< -20	-22.70	-2.70
64	6 Mbps	< -20	-46.45	-26.45
	24 Mbps	< -20	-47.63	-27.63
	54 Mbps	< -20	-47.42	-27.42
100	6 Mbps	< -20	-47.30	-27.30
	24 Mbps	< -20	-49.01	-29.01
	54 Mbps	< -20	-48.43	-28.43
149	6 Mbps	< -20	-36.73	-16.73
	24 Mbps	< -20	-36.85	-16.85
	54 Mbps	< -20	-36.95	-16.95
161	6 Mbps	< -20	-44.68	-24.68
	24 Mbps	< -20	-43.99	-23.99
	54 Mbps	< -20	-47.32	-27.32
165	6 Mbps	< -20	-25.76	-5.76
	24 Mbps	< -20	-25.94	-5.94
	54 Mbps	< -20	-26.03	-6.03

See figures 6-16 to 6-23 for the plots of the band edge compliance measurements for Channel 36, 48, 52, 64, 100, 149, 161 and 165 at 6 Mbps each for 802.11a mode.

802.11n RF Conducted Emission Test Results

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	MCS 0	< -20	-46.86	-26.86
	MCS 4	< -20	-49.55	-29.55
	MCS 7	< -20	-46.99	-26.99
64	MCS 0	< -20	-48.04	-28.04
	MCS 4	< -20	-50.36	-30.36
	MCS 7	< -20	-48.96	-28.96
165	MCS 0	< -20	-24.79	-4.79
	MCS 4	< -20	-23.88	-3.88
	MCS 7	< -20	-24.70	-4.70

See figures 6-24 to 6-26 for the plots of the band edge compliance measurements for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

802.11a RF Conducted Emission Test Results cont'd

Figure 6-16: Band Edge Compliance 802.11a, Channel 36, 6 Mbps

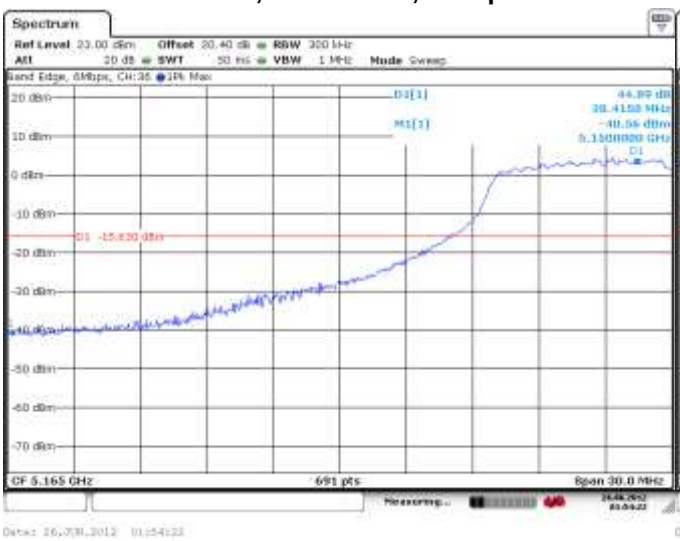


Figure 6-17: Band Edge Compliance 802.11a, Channel 48, 6 Mbps

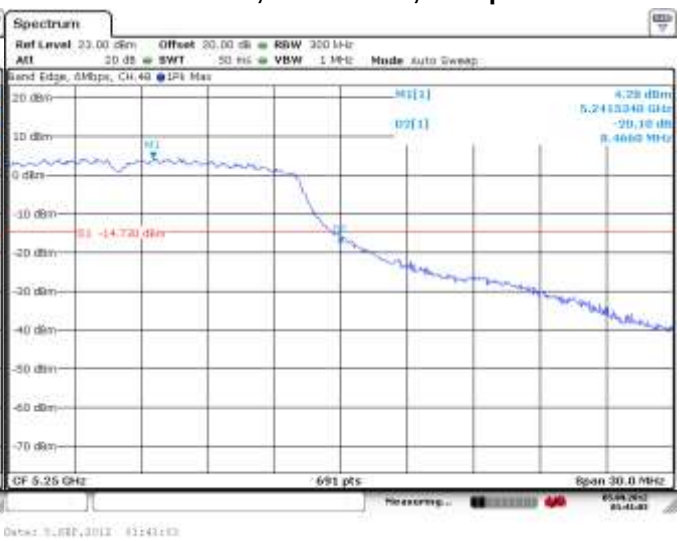


Figure 6-18: Band Edge Compliance 802.11a, Channel 52, 6 Mbps

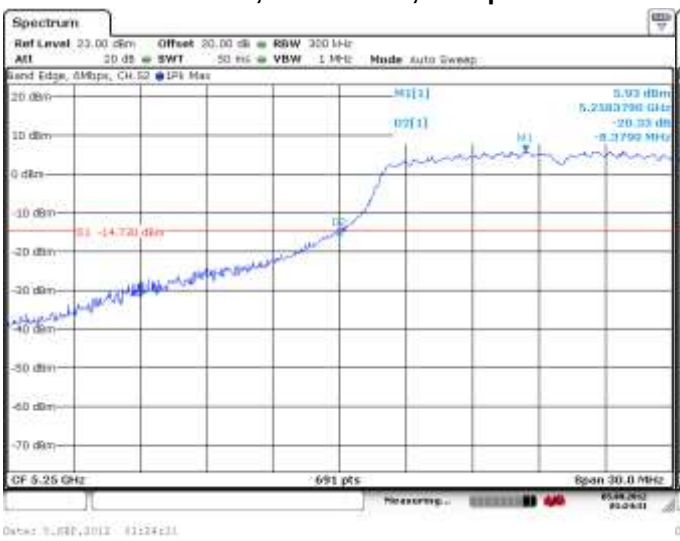
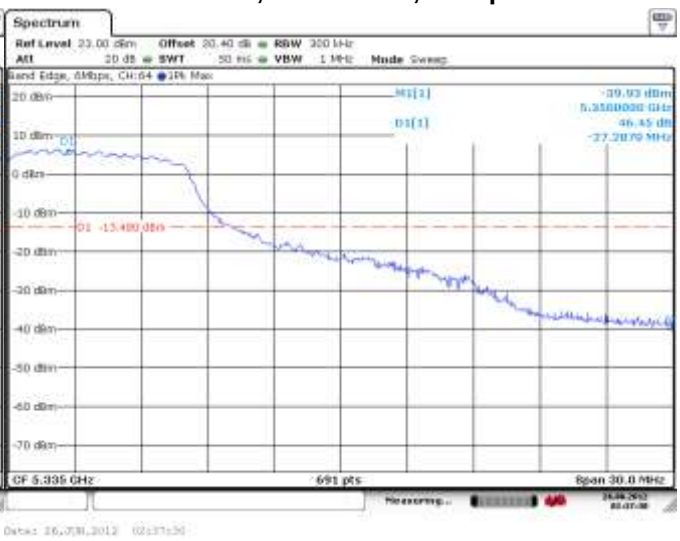


Figure 6-19: Band Edge Compliance 802.11a, Channel 64, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-20: Band Edge Compliance 802.11a, Channel 100, 6 Mbps

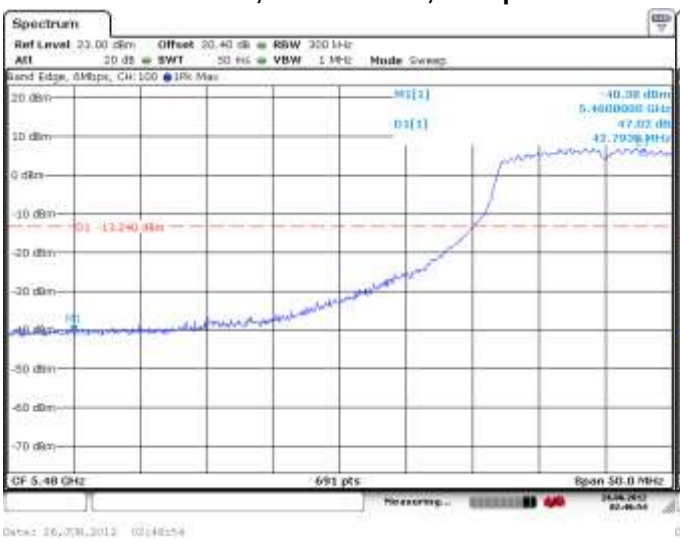


Figure 6-21: Band Edge Compliance 802.11a, Channel 149, 6 Mbps

Figure 6-22: Band Edge Compliance 802.11a, Channel 161, 6 Mbps

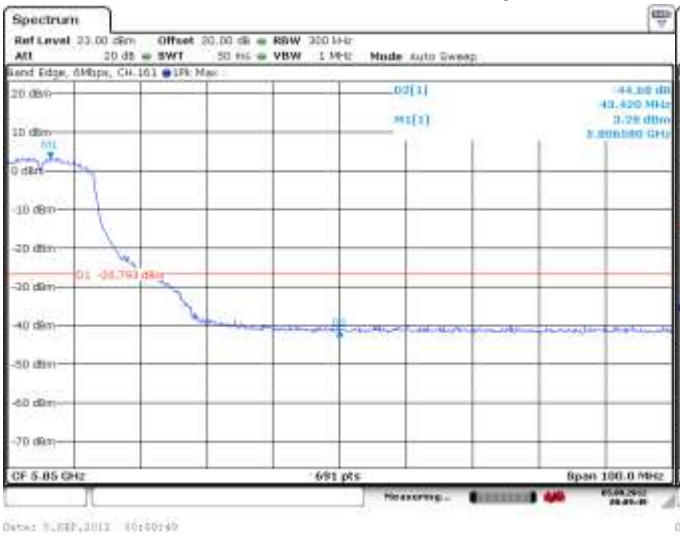
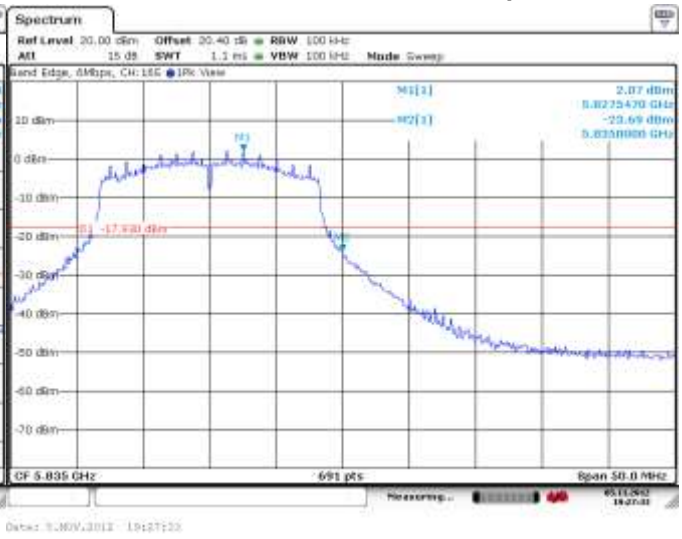


Figure 6-23: Band Edge Compliance 802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 6-24: Band Edge Compliance
802.11n, Channel 36, MCS 0

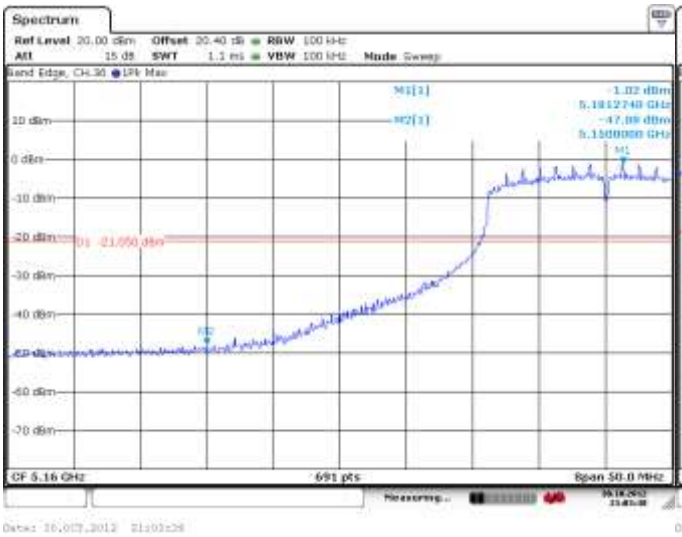


Figure 6-25: Band Edge Compliance
802.11n, Channel 64, MCS 0

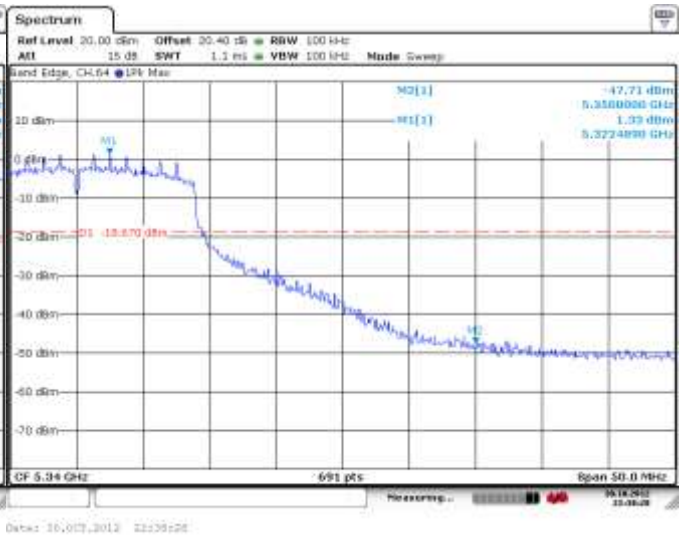
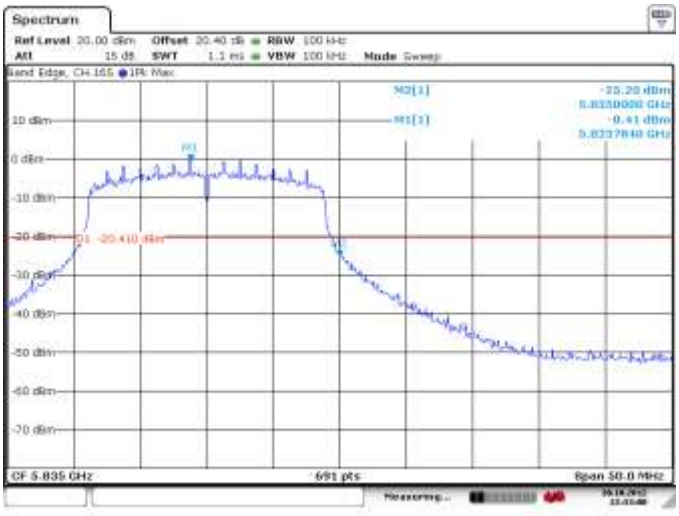


Figure 6-26: Band Edge Compliance
802.11n, Channel 165, MCS 0



802.11a RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 8.00	-12.05	-20.05
	24 Mbps	< 8.00	-12.95	-20.95
	54 Mbps	< 8.00	-13.72	-21.72
44	6 Mbps	< 8.00	-10.58	-18.58
	24 Mbps	< 8.00	-12.10	-20.10
	54 Mbps	< 8.00	-13.73	-21.73
48	6 Mbps	< 8.00	-11.92	-19.92
	24 Mbps	< 8.00	-12.54	-20.54
	54 Mbps	< 8.00	-13.45	-21.45
52	6 Mbps	< 8.00	-10.60	-18.60
	24 Mbps	< 8.00	-11.00	-19.00
	54 Mbps	< 8.00	-12.79	-20.79
60	6 Mbps	< 8.00	-8.64	-16.64
	24 Mbps	< 8.00	-9.13	-17.13
	54 Mbps	< 8.00	-10.35	-18.35
64	6 Mbps	< 8.00	-8.64	-16.64
	24 Mbps	< 8.00	-9.21	-17.21
	54 Mbps	< 8.00	-10.03	-18.03
149	6 Mbps	< 8.00	-11.67	-19.67
	24 Mbps	< 8.00	-12.23	-20.23
	54 Mbps	< 8.00	-13.49	-21.49
157	6 Mbps	< 8.00	-10.73	-18.73
	24 Mbps	< 8.00	-11.22	-19.22
	54 Mbps	< 8.00	-12.34	-20.34
161	6 Mbps	< 8.00	-11.68	-19.68
	24 Mbps	< 8.00	-12.31	-20.31
	54 Mbps	< 8.00	-13.12	-21.12
165	6 Mbps	< 8.00	-14.71	-22.71
	24 Mbps	< 8.00	-15.25	-23.25
	54 Mbps	< 8.00	-15.89	-23.89

See figures 6-27 to 6-36 for the plots of the peak power spectral density for Channel 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 at 6 Mbps each for 802.11a mode.

802.11n RF Conducted Emission Test Results

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 8.00	-12.05	-20.05
	24 Mbps	< 8.00	-12.95	-20.95
	54 Mbps	< 8.00	-13.72	-21.72
64	6 Mbps	< 8.00	-8.64	-16.64
	24 Mbps	< 8.00	-9.21	-17.21
	54 Mbps	< 8.00	-10.03	-18.03
165	6 Mbps	< 8.00	-14.71	-22.71
	24 Mbps	< 8.00	-15.25	-23.25
	54 Mbps	< 8.00	-15.89	-23.89

See figures 6-37 to 6-39 for the plots of the peak power spectral density for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

802.11a RF Conducted Emission Test Results cont'd

Figure 6-27: Peak Power Spectral Density 802.11a, Channel 36, 6 Mbps

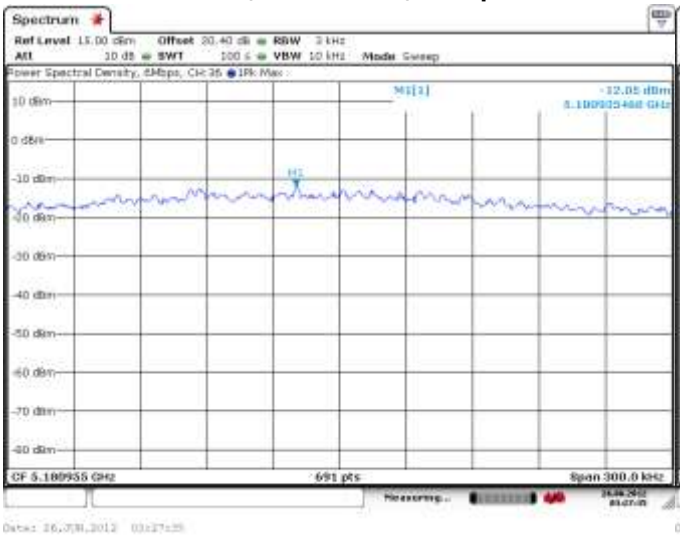


Figure 6-28: Peak Power Spectral Density 802.11a, Channel 44, 6 Mbps

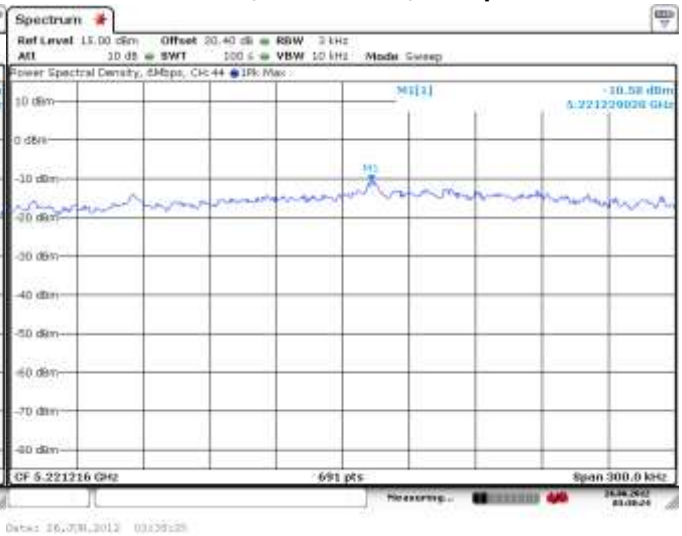


Figure 6-29: Peak Power Spectral Density 802.11a, Channel 48, 6 Mbps

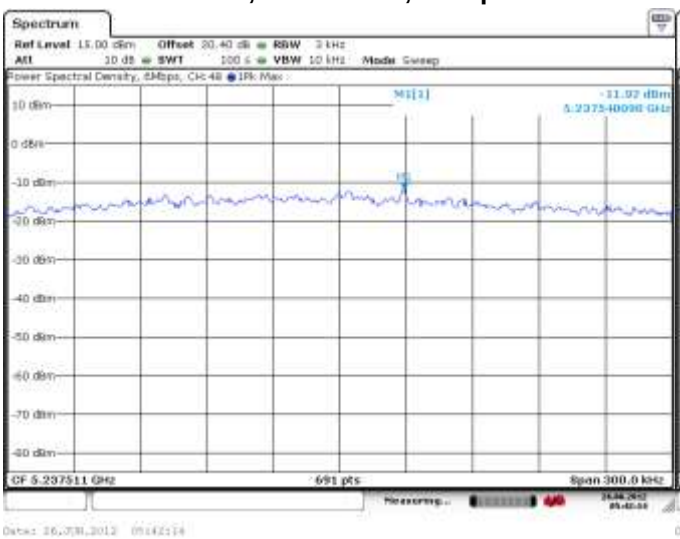
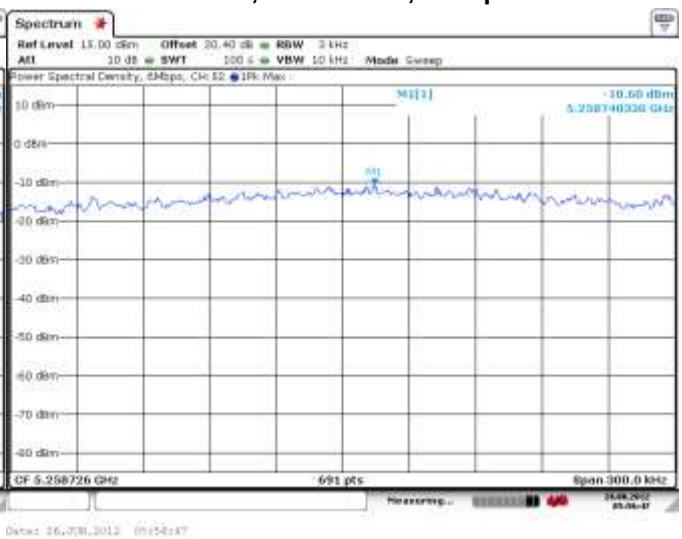


Figure 6-30: Peak Power Spectral Density 802.11a, Channel 52, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-31: Peak Power Spectral Density 802.11a, Channel 60, 6 Mbps

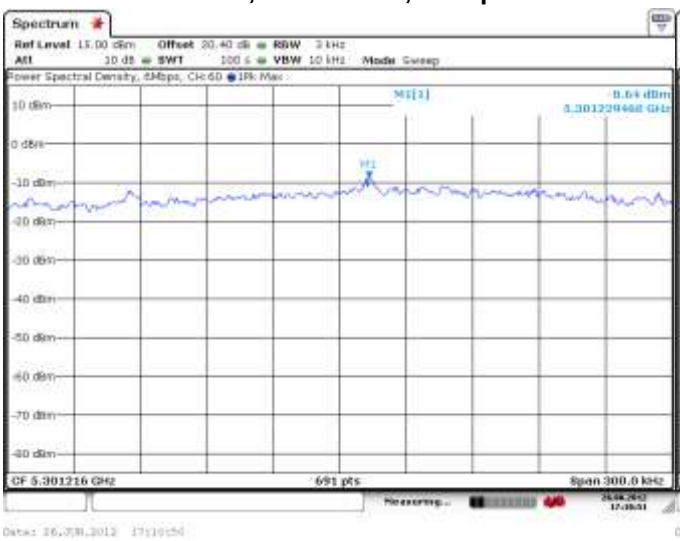


Figure 6-32: Peak Power Spectral Density 802.11a, Channel 64, 6 Mbps

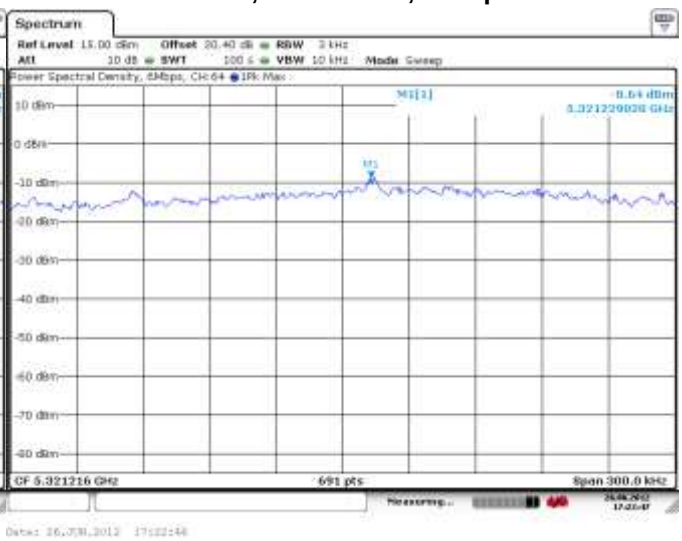


Figure 6-33: Peak Power Spectral Density 802.11a, Channel 149, 6 Mbps

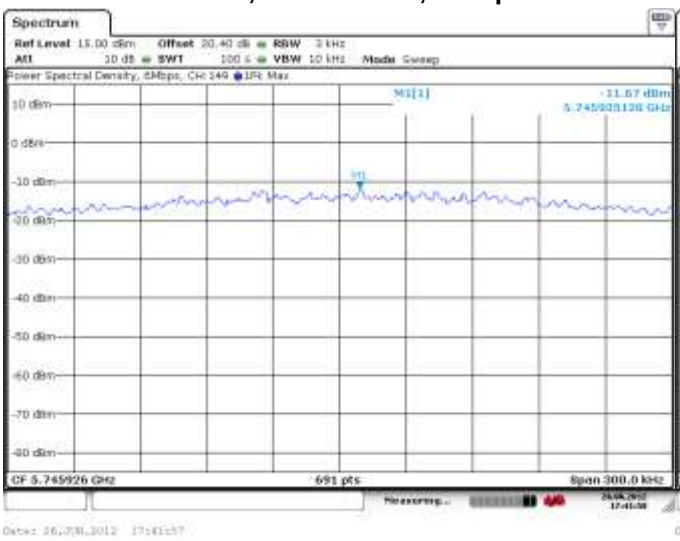
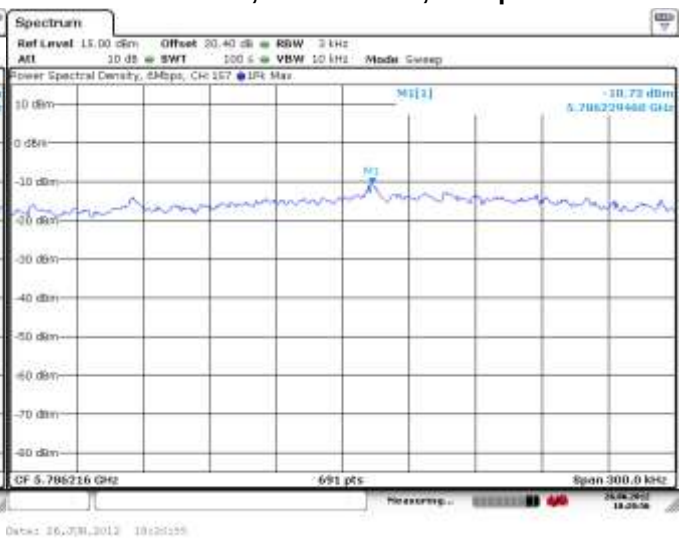


Figure 6-34: Peak Power Spectral Density 802.11a, Channel 157, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-35: Peak Power Spectral Density 802.11a, Channel 161, 6 Mbps

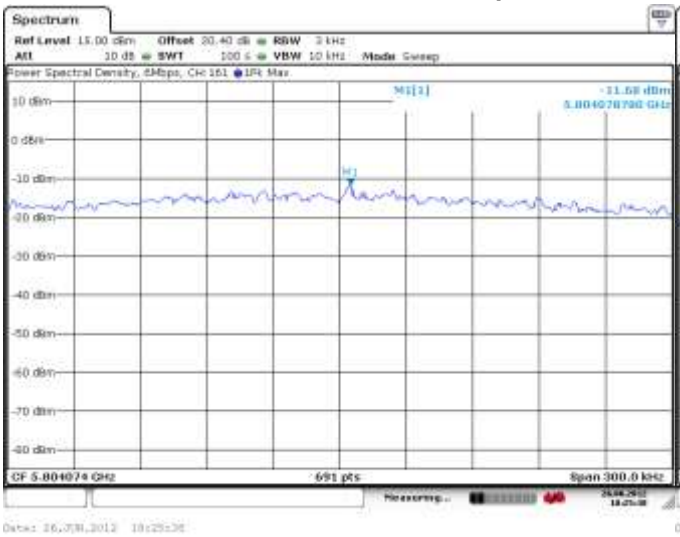
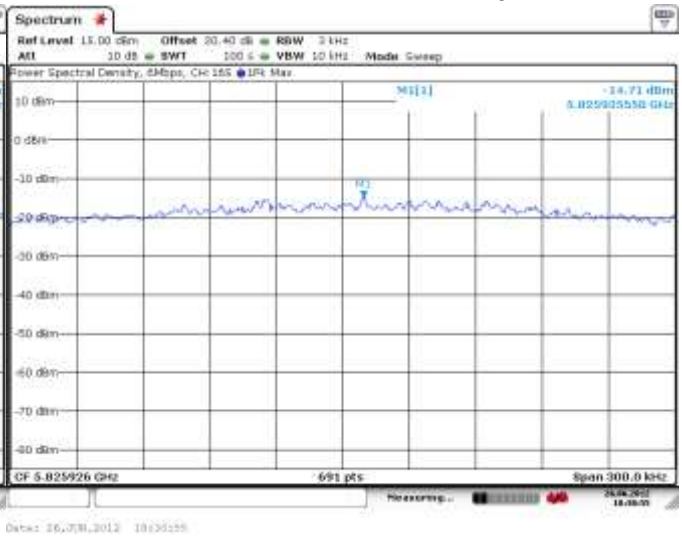


Figure 6-36: Peak Power Spectral Density 802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 6-37: Peak Power Spectral Density
802.11n, Channel 36, MCS 0

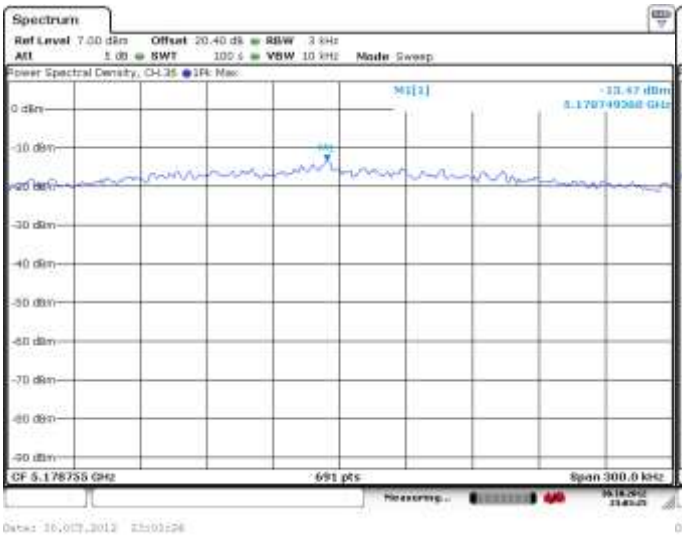


Figure 6-38: Peak Power Spectral Density
802.11n, Channel 64, MCS 0

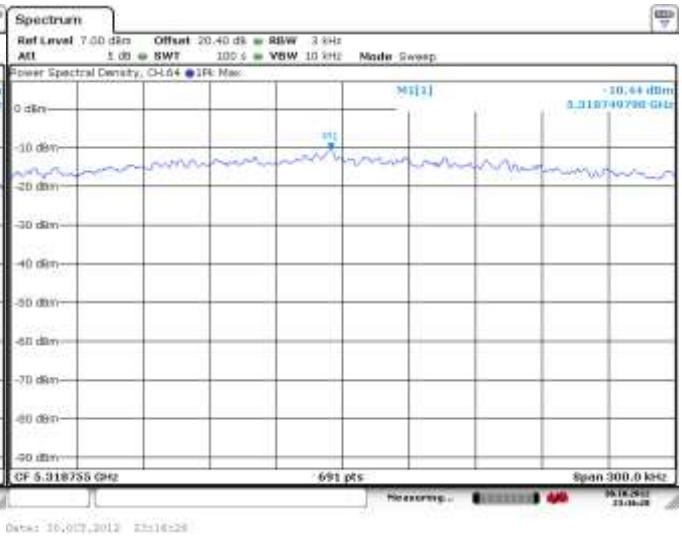
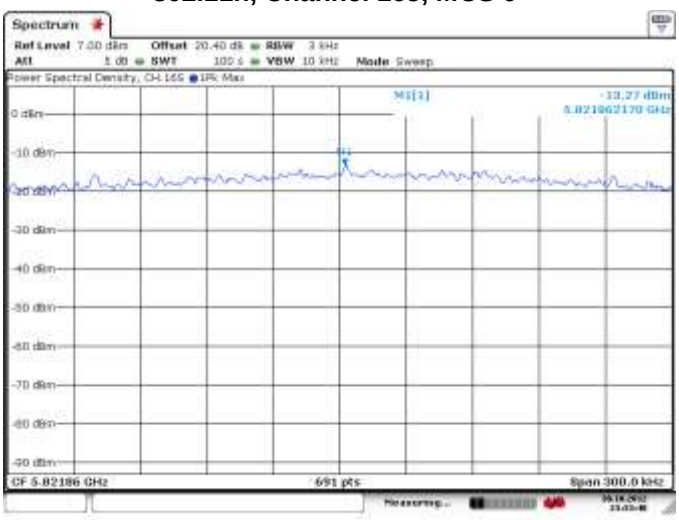


Figure 6-39: Peak Power Spectral Density
802.11n, Channel 165, MCS 0



802.11a RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

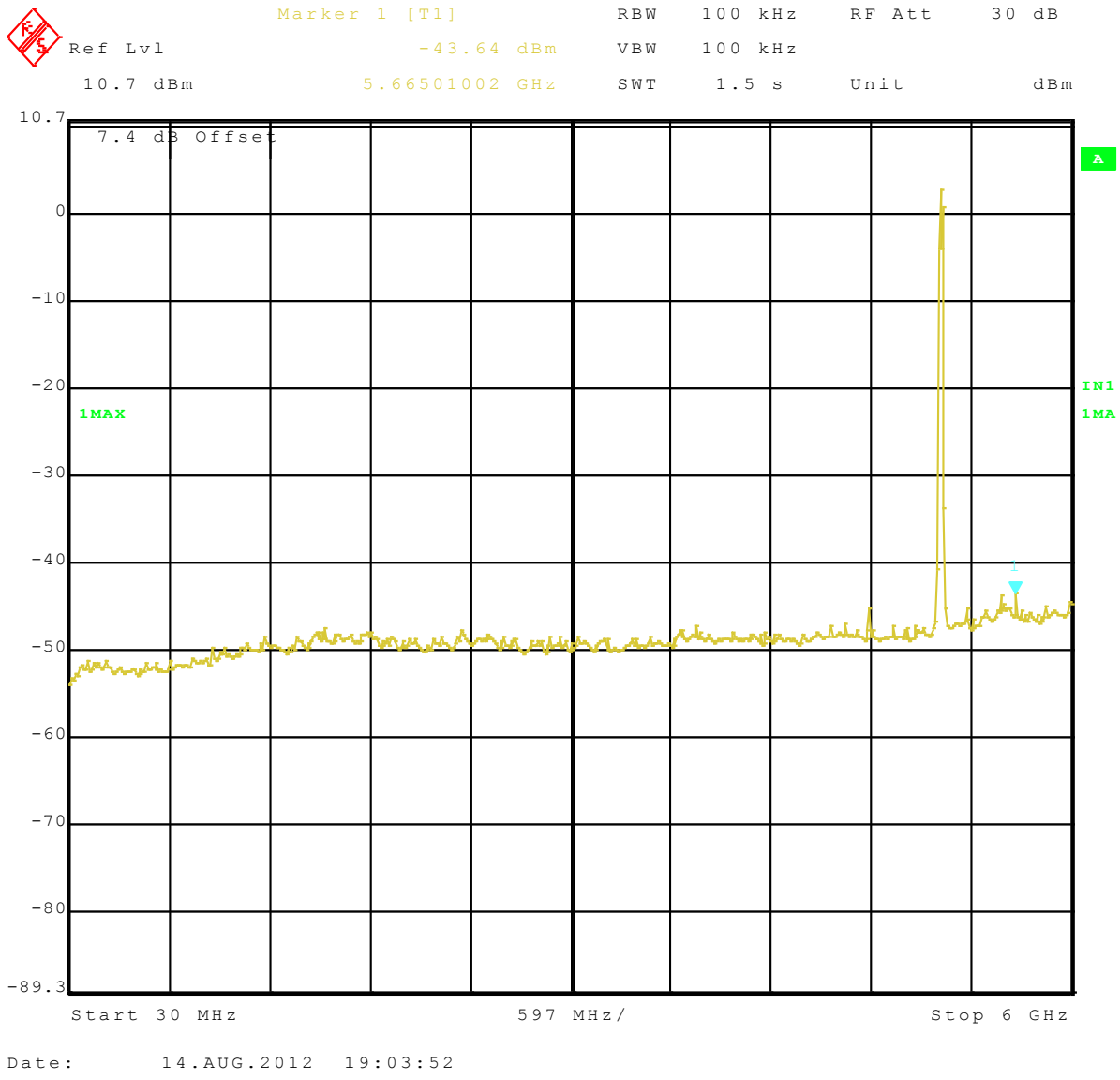
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 44, 60, and 157 were measured at 6 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Limit (dBc)	Margin (dB)
44	6 Mbps	12.53	-33.22	-20	-13.22
60	6 Mbps	14.32	-32.29	-20	-12.29
157	6 Mbps	12.17	-33.52	-20	-13.52

See figures 6-40 to 6-42 for the plots of the spurious RF conducted emissions for Channel 44, 60 and 157 at 6 Mbps each for 802.11a mode.

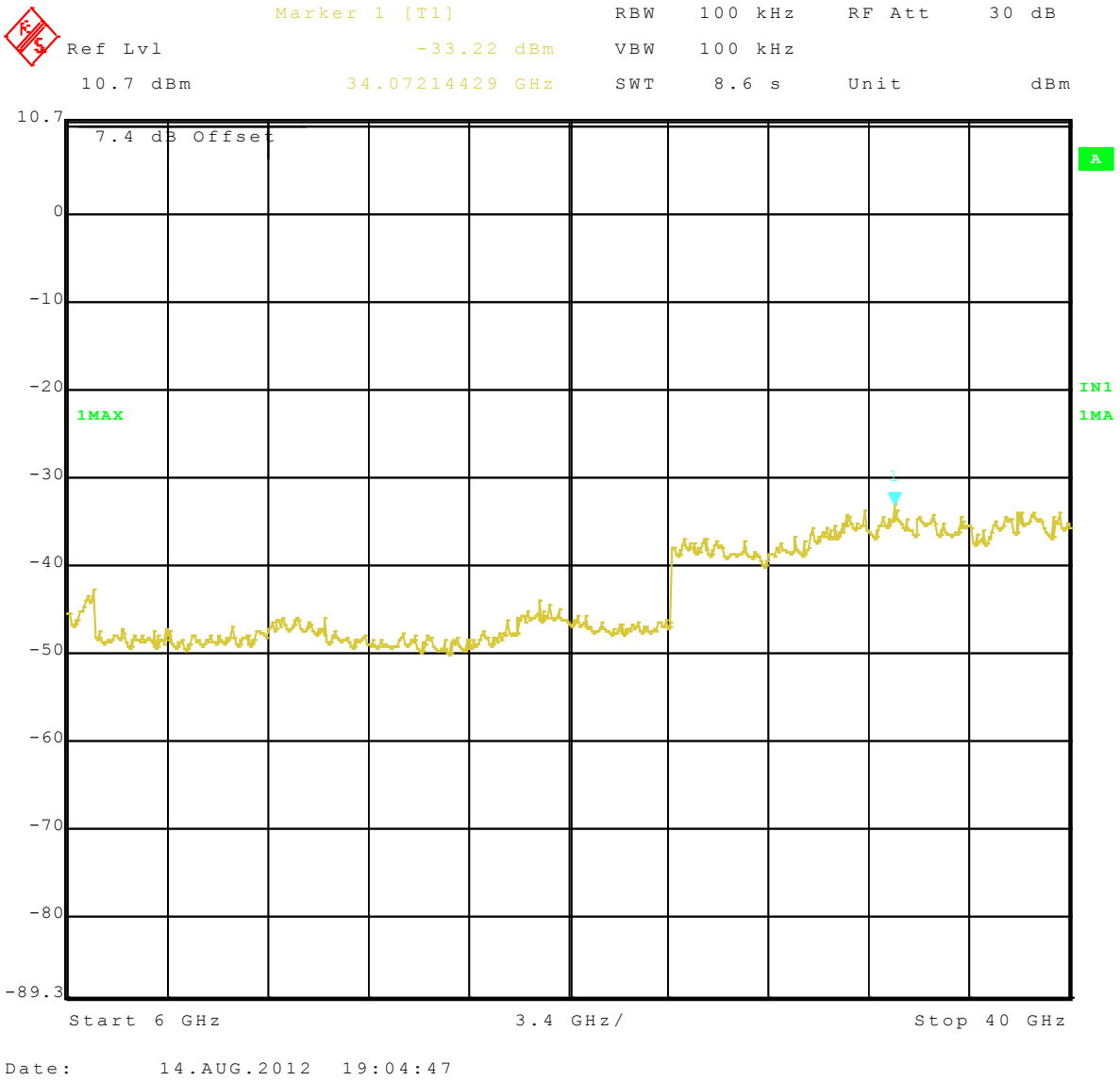
802.11a RF Conducted Emission Test Results cont'd

Figure 6-31a: Spurious RF Conducted Emissions, 802.11a Channel 44, 6 Mbps



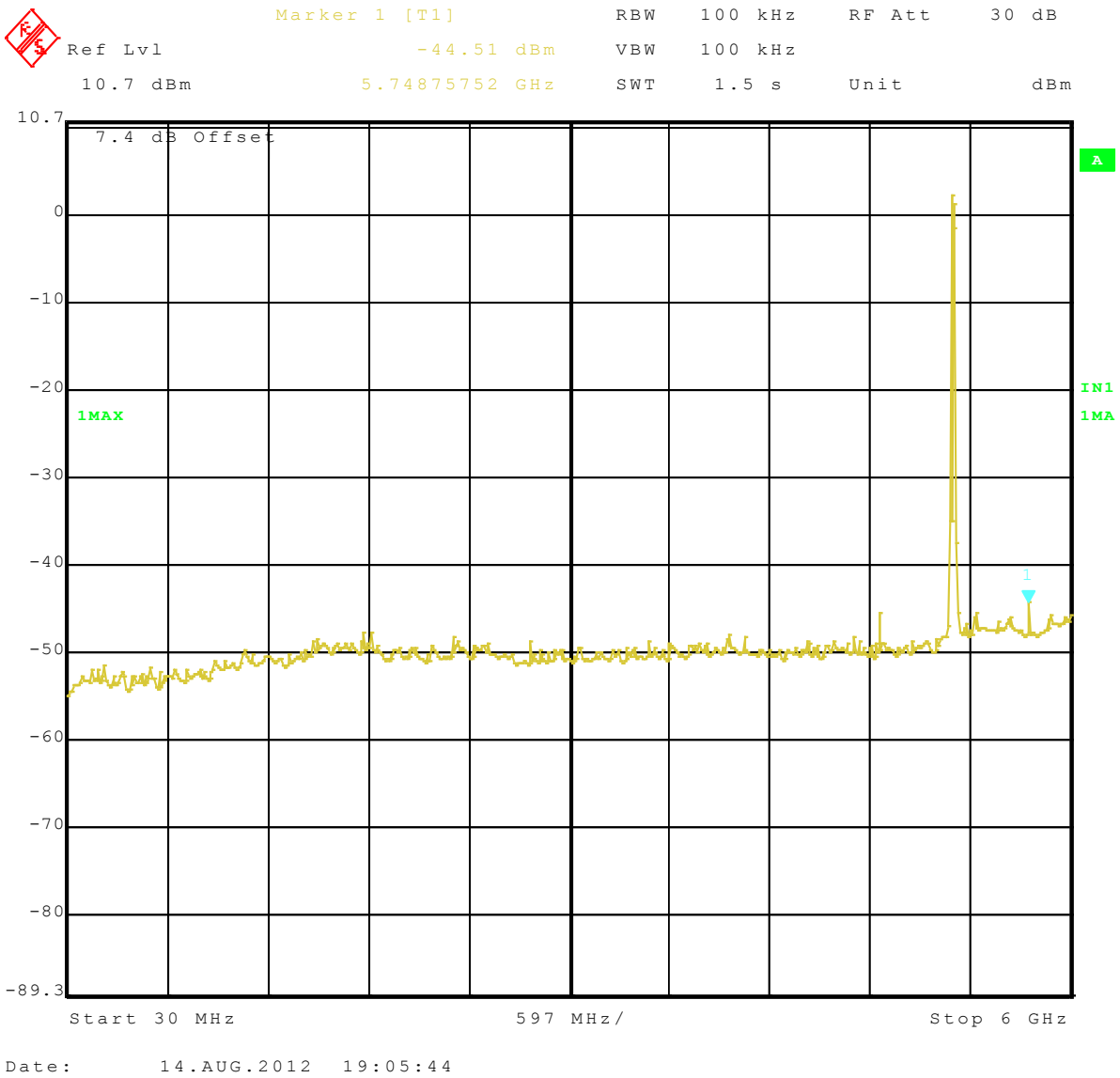
802.11a RF Conducted Emission Test Results cont'd

Figure 6-31b: Spurious RF Conducted Emissions, 802.11a Channel 44, 6 Mbps



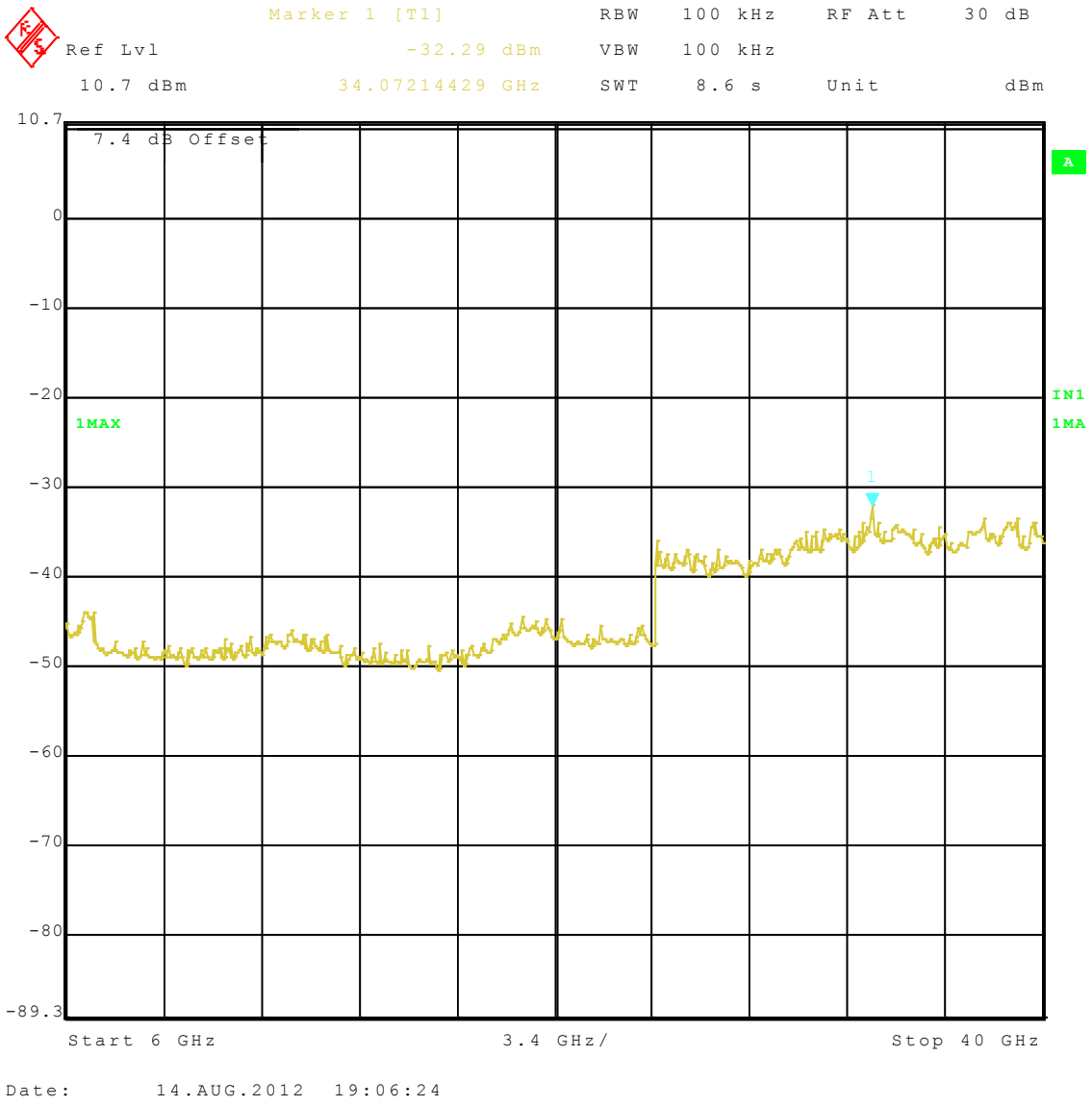
802.11a RF Conducted Emission Test Results cont'd

Figure 6-32a: Spurious RF Conducted Emissions, 802.11a Channel 60, 6 Mbps



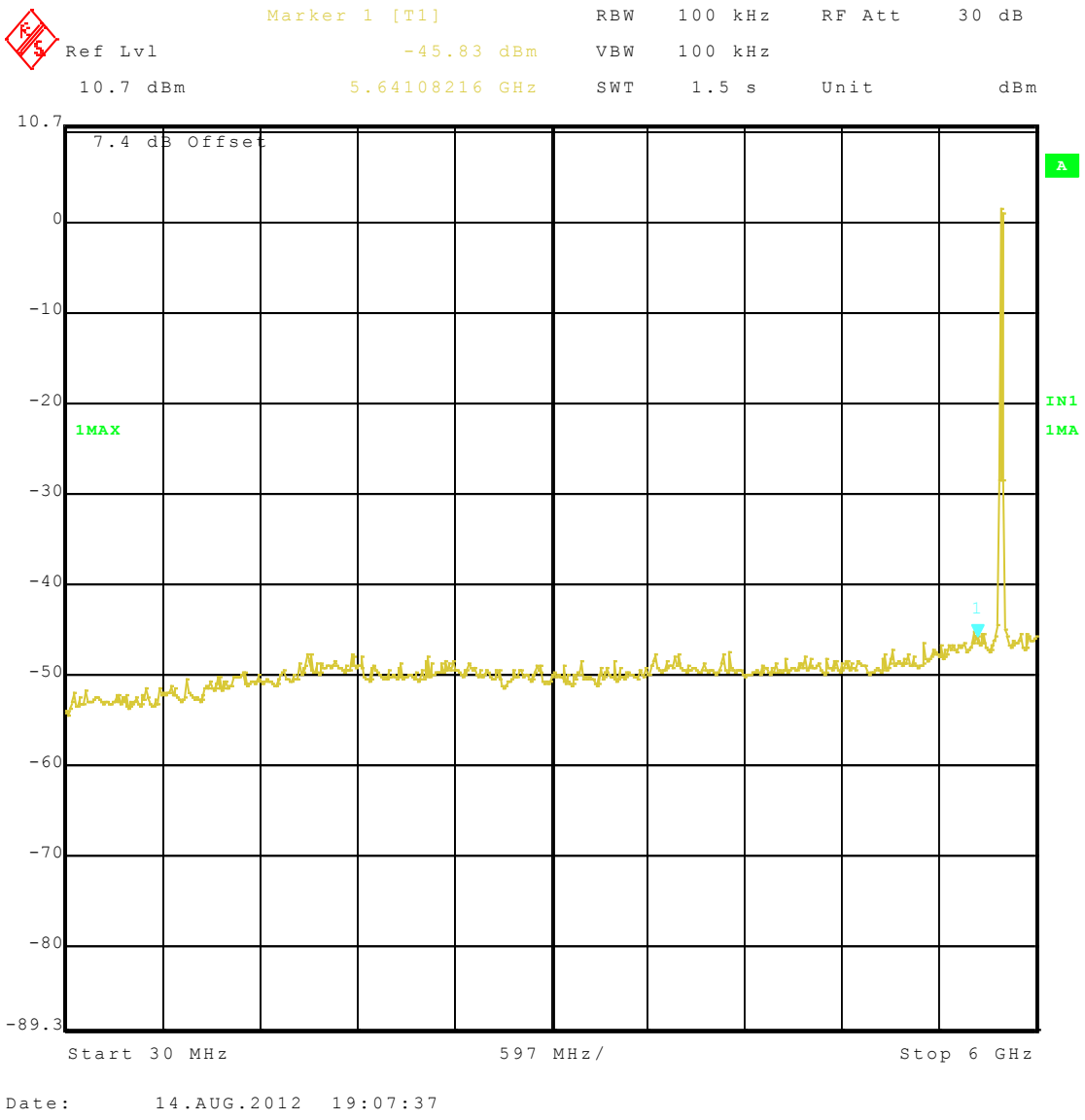
802.11a RF Conducted Emission Test Results cont'd

Figure 6-32b: Spurious RF Conducted Emissions, 802.11a Channel 60, 6 Mbps



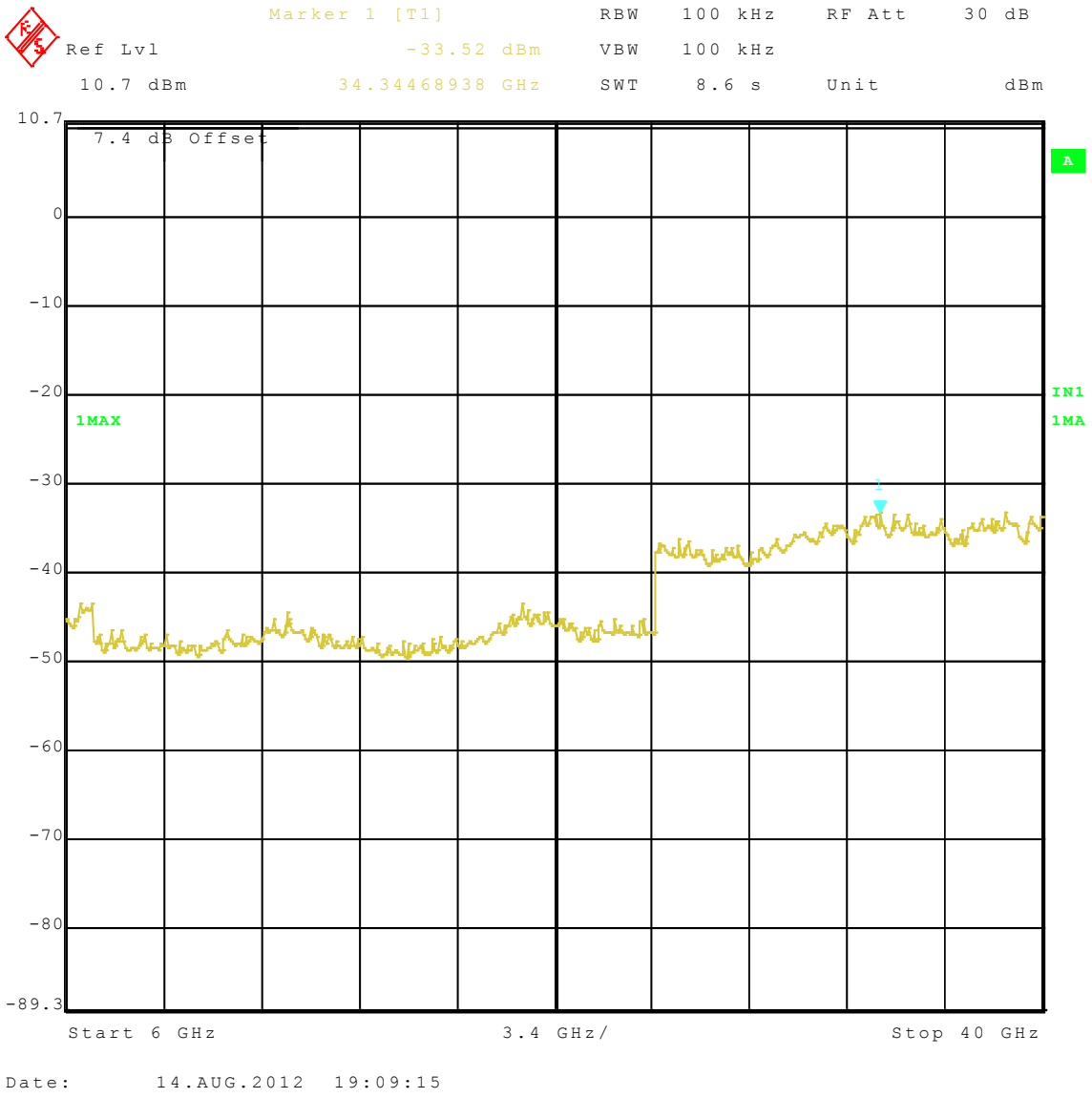
802.11a RF Conducted Emission Test Results cont'd

Figure 6-33a: Spurious RF Conducted Emissions, 802.11a Channel 157, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-33b: Spurious RF Conducted Emissions, 802.11a Channel 157, 6 Mbps



APPENDIX 7 – NEAR FIELD COMMUNICATIONS TEST DATA/PLOTS

Near Field Communications (NFC) Test Results

Radiated Emissions

Date of Test: July 09, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 30 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 9 kHz to 1 GHz.

The BlackBerry® smartphone was in vertical position.

The frequency sweep measurements were performed in Near Field Communications Tx mode at 13.56 MHz.

Frequency (MHz)	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV/m)	Limit (dBµV/m)	Test Margin (dB)
13.56	31.90	18.56	50.46	124.00	-73.54

All other emissions had a test margin of greater than 25.0 dB.

Near Field Communications (NFC) Test Results cont'd

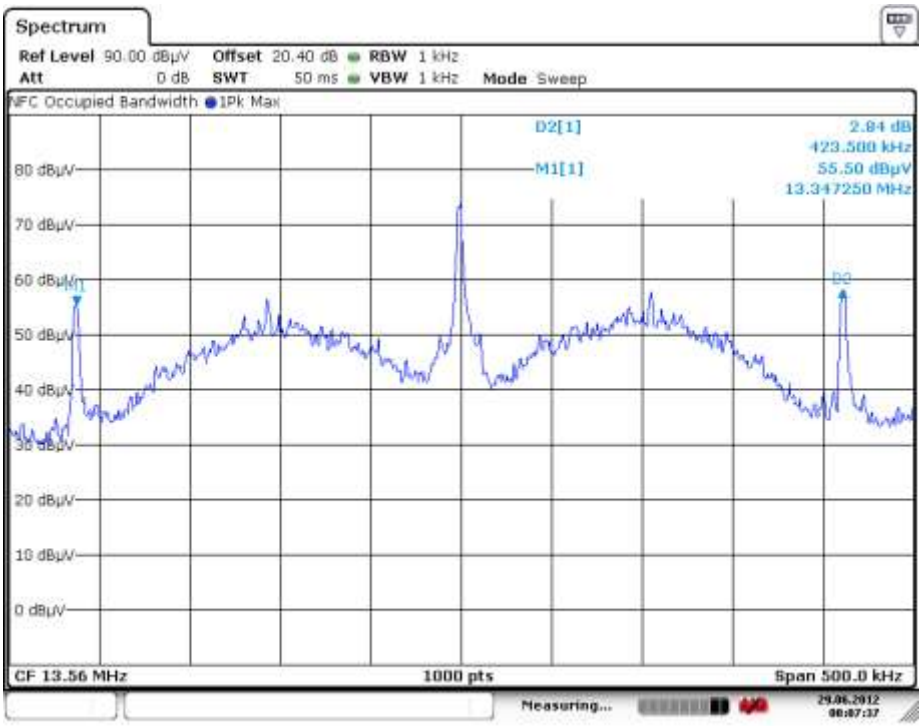
Occupied Bandwidth

Date of test: June 29, 2012.
The measurements were performed by Kevin Guo.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 46 %

Operation mode (TX ON)	Occupied Bandwidth (kHz)
NFC, modulated	423.50

Figure 7-1: Occupied Bandwidth, NFC TX Frequency = 13.56 MHz



Date: 29.JUN.2012 08:07:36

Near Field Communications (NFC) Test Results cont'd

Frequency Stability

Date of test: July 13, 2012.
The measurements were performed by Kevin Guo.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 46 %

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
-20	13.56	13.559255	3.6	-745	-0.00550	-54.9631
-20	13.56	13.559182	3.7	-818	-0.00603	-60.3024
-20	13.56	13.559103	4.2	-897	-0.00662	-66.1726
-20	13.56	13.558980	4.35	-1020	-0.00752	-75.2212
-10	13.56	13.559110	3.6	-890	-0.00656	-65.6342
-10	13.56	13.559103	3.7	-897	-0.00662	-66.1726
-10	13.56	13.559175	4.2	-825	-0.00608	-60.8407
-10	13.56	13.559281	4.35	-719	-0.00530	-53.0236
0	13.56	13.559139	3.6	-861	-0.00635	-63.5029
0	13.56	13.559197	3.7	-803	-0.00592	-59.2330
0	13.56	13.559219	4.2	-782	-0.00576	-57.6327
0	13.56	13.559327	4.35	-673	-0.00496	-49.6239
10	13.56	13.559197	3.6	-803	-0.00592	-59.2330
10	13.56	13.559204	3.7	-796	-0.00587	-58.6947
10	13.56	13.559030	4.2	-970	-0.00715	-71.5044
10	13.56	13.558989	4.35	-1011	-0.00746	-74.5575
20	13.56	13.559197	3.6	-803	-0.00592	-59.2330
20	13.56	13.559117	3.7	-883	-0.00651	-65.1032
20	13.56	13.559001	4.2	-999	-0.00736	-73.6431
20	13.56	13.559205	4.35	-795	-0.00586	-58.6357

Near Field Communications (NFC) Test Results cont'd

Frequency Stability cont'd

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
30	13.56	13.559030	3.6	-970	-0.00715	-71.5044
30	13.56	13.559197	3.7	-803	-0.00592	-59.2330
30	13.56	13.558980	4.2	-1020	-0.00752	-75.2434
30	13.56	13.558992	4.35	-1008	-0.00743	-74.3193
40	13.56	13.559001	3.6	-999	-0.00736	-73.6431
40	13.56	13.559038	3.7	-962	-0.00710	-70.9735
40	13.56	13.559095	4.2	-905	-0.00667	-66.7035
40	13.56	13.559115	4.35	-885	-0.00652	-65.2360
50	13.56	13.559016	3.6	-984	-0.00726	-72.5737
50	13.56	13.558958	3.7	-1042	-0.00768	-76.8437
50	13.56	13.559088	4.2	-912	-0.00672	-67.2345
50	13.56	13.559103	4.35	-897	-0.00661	-66.1357
60	13.56	13.558987	3.6	-1013	-0.00747	-74.7050
60	13.56	13.559103	3.7	-897	-0.00662	-66.1726
60	13.56	13.559016	4.2	-984	-0.00726	-72.5737
60	13.56	13.558985	4.35	-1015	-0.00748	-74.8230